



**Appendix 6-I Treatment Feasibility Study
Cat Canyon Oil Field-
Sisquoc Sands
and Monterey Formation**

Santa Barbara County, California

June 2017

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1 Treatment Feasibility Study

The treatability analysis is directed to assessing the status of the Sisquoc and Monterey formations of Cat Canyon Oil Field. **Figure 1.2-1, Location Map** shows the relationship of the existing and proposed oil field operations. For the Treatment Feasibility:

- The Monterey Formation is studied on field-wide formation;
- The Sisquoc Formation Elements are studied in the context of being sand units.

Formation	Horizontal Expansion	Vertical Expansion	Current Status	Notes
Gato Ridge:				
Basal Sisquoc	Increase Area		Exempted	Resolve Name for Basal Sisquoc Elements
Monterey	Increase Area	Total Fm.	Buff and Brown	Brown & Buff-(Small Portion of Monterey)
Central Area:				
Sisquoc	Increase Area		Sisquoc Only	
East Area:				
Sisquoc	Increase Area		Exempted	
Brooks	Increase Area		Exempted	Resolve Name for Basal Sisquoc Elements
Monterey	Increase Area		Exempted	
Sisquoc Area:				
Sisquoc	Increase Area		Exempted	
Thomas	Increase Area		Exempted	Resolve Name for Basal Sisquoc Elements
Monterey	None		Exempted	

All calculations supporting the economic analysis are in **Appendix I, Calculation Worksheets**.

1.1 Regulatory Guidance

USEPA and Department of Conservation Division of Oil, Gas, and Geothermal Resources, (DOGGR), provide guidance on the need for certain aquifer exemption applications and the manner in which the treatability feasibility analysis is to be performed. This feasibility analysis relies on USEPA “Guidelines for Ground Water Classification under the EPA Ground-Water Protection Strategy”, 1986. (US EPA, 1986)

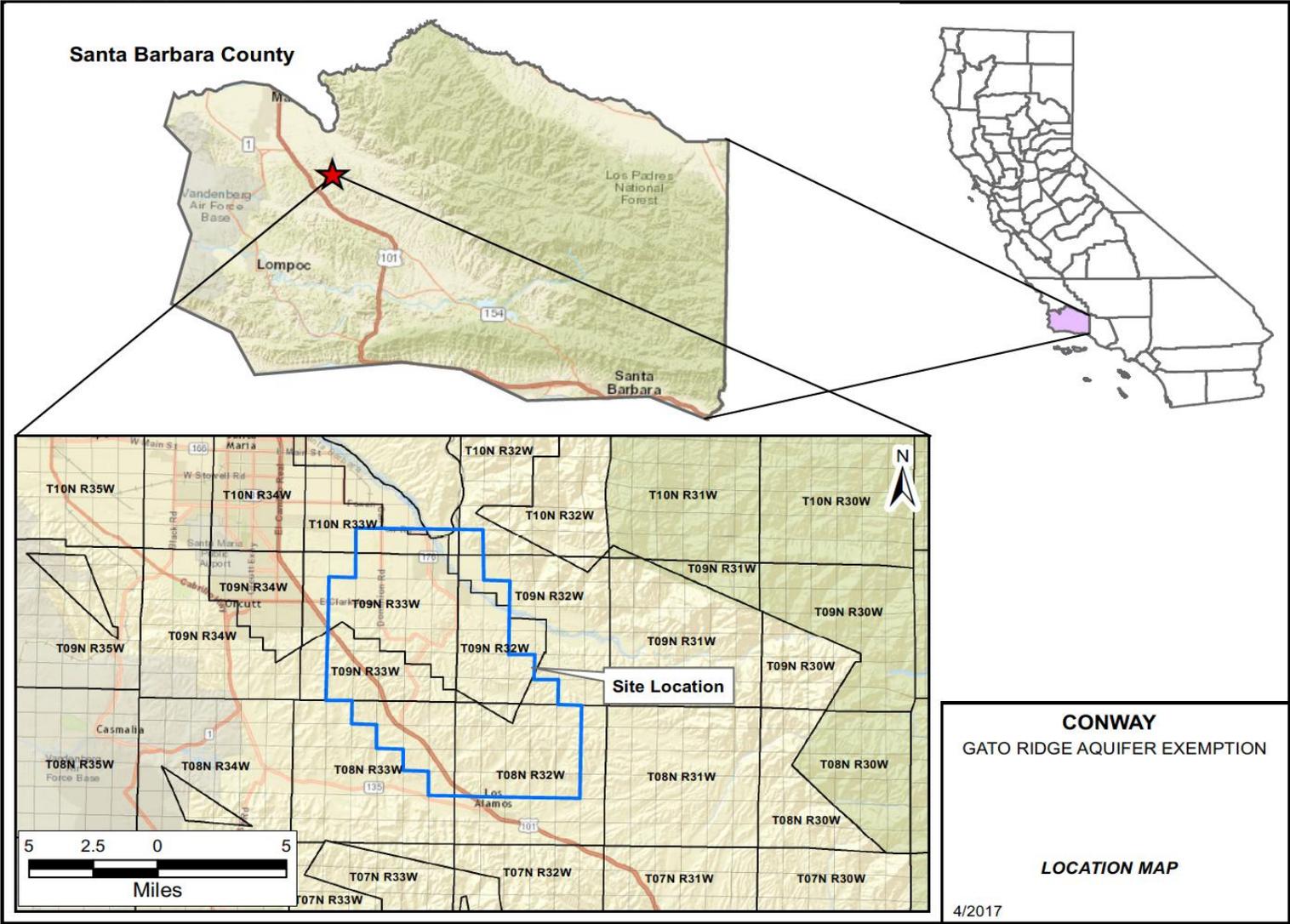
Objectives for treatment systems are defined by the most protective levels set forth by EPA MCLs or the guidelines from the Regional Water Quality Control Board, Central Coastal Region, (Central Coast Regional Water Quality Control Board, 2011).

1.2 Regional Setting

The area of the Cat Canyon Oil Field Administrative Boundary is approximately 26,450 acres. The treatability analysis is directed to assessing the status of the Sisquoc Sands and Monterey formations. **Figure 1.2-1, Location Map** shows the relationship of the existing and proposed oilfield operations. The community of Los Alamos is not within the Administrative Boundary of the Cat Canyon Oil Field; however, Los Alamos CDP lies directly adjacent to the southwest. The community of Sisquoc is within the Administrative Boundary of Cat Canyon Oil Field. This study assumes the water is conveyed from the center of the oil field to the nearest connection point in the nearest CDP: Los Alamos, served by Los Alamos Community Service District for the Los Gatos Ridge Area and Sisquoc CDP, served by Golden State Water Company for the rest of the Areas in Cat Canyon Oil Field.

For all modeled cases, the proposed pipeline route is estimated to be 3 miles as the crow flies, allowing for easements and environmental routing criteria; piping costs have minimal impact on the Treatment Feasibility costing, see sensitivity analysis, **Figure 1.2-2, Potential Pipe Routes**. Per Capita Water Use is estimated to be 194 gallons per person-day. (County, 2013, pp. Appendix 3-A) .

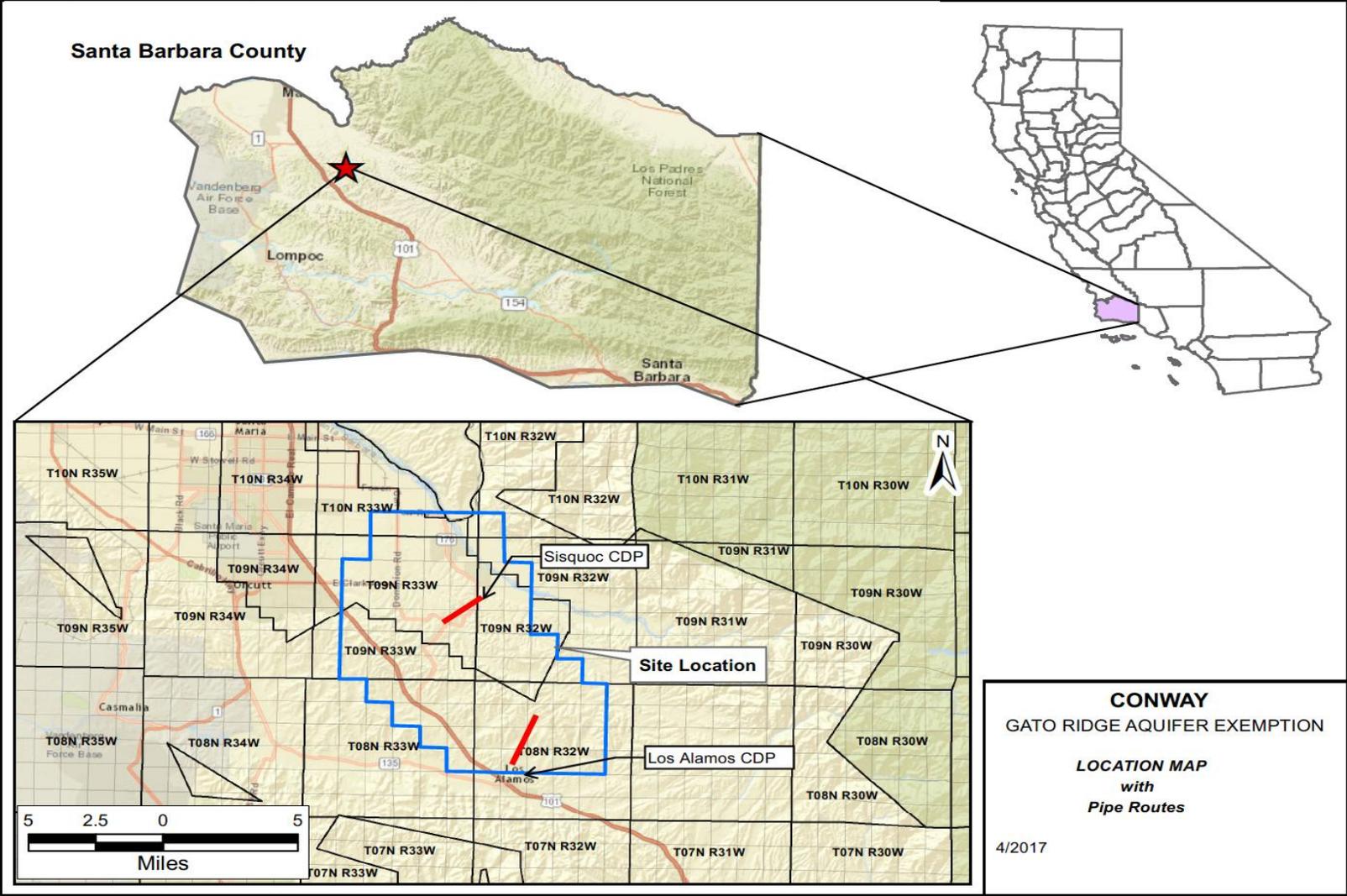
K:\Conway\Gato Ridge Aquifer Exemption\GIS\Gato Ridge AE - Location Map



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Figure 1.2-1

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Figure 1.2-2

1.2.1 Proposed Exemption Expansion Formation Water Composition

Oil is produced from the area formations and the subject formations. Future plans for the recovery of the oil would include injection of water and steam into the confined Monterey formation and the Sisquoc Sands. These formations are discussed in the **Aquifer Exemption Expansion Application Study, Section 4, Regional Geology**.

The data in **Table 1.2-1, Summary of: Sisquoc Sands and Monterey Formation Water and Appendix II, Formation Water Analysis**, shows the field-wide formation composition for the treatability feasibility study for both the Monterey Formation and the Sisquoc Sands:

Table 1.2-1: Summary of Reviewed Data by Area and Formation (mg/L)

Area	Formation		TDS	B	Na	CL	SO4	HCO3	Ca	K	Mg
Sisquoc	Average Sisquoc	Mean	10281	26	1143	3142	116	4530	118	49	207
		Std. Dev	8352	9	709	2839	211	4962	54	57	172
		Count	33	24	29	31	29	31	10	29	29
	Post Steaming Production	Mean	5707	25	961	1756	75	2209	104	41	247
		Std. Dev	2422	9	426	980	46	1572	50	60	179
		Count	22	20	22	22	22	22	8	22	21
	Native Sisquoc Formation	Mean	22216	27	1847	7794	295	12447	160	73	101
		Std. Dev	7063	20	1142	2348	500	4957		51	120
		Count	9	2	6	7	5	7	1	5	6
	Monterey	Mean	10417	7	1153	3216	57	4657	82	26	98
		Std. Dev	6445	5	798	1828	51	2395	73	23	82
		Count	14	14	14	14	14	14	6	14	12
Central	Sisquoc	Mean	10745	28	1641	4001	47	5539	29	36	21
		Std. Dev	3815	20	801	1420	22	2496	8	24	17
		Count	14	11	11	11	11	11	4	11	8
	Monterey	Mean	12314	19	1188	4033	67	5109	44	41	56
		Std. Dev	6823	22	454	1958	87	2221	7	68	37
		Count	17	7	16	16	17	17	5	16	15
East	Monterey	Mean	10417	7	1153	3216	57	4657	82	26	98
		Std. Dev	6445	5	798	1828	51	2395	73	23	82
		Count	14	14	14	14	14	14	6	14	12
	Sisquoc	Mean	7668	12	1263	2740	27	3528	41	16	75
		Std. Dev	2547	12	768	1019	20	1806	12	11	51
		Count	17	9	14	14	14	14	2	13	13
West	Monterey	Mean	12314	19	1188	4033	67	5109	44	41	56
		Std. Dev	6823	22	454	1958	87	2221	7	68	37
		Count	17	7	16	16	17	17	5	16	15
	Sisquoc	Mean	22007	42	876	8063	147	12252	15	50	49
		Std. Dev	5280	29	442	2096	103	3700		28	94
		Count	9	5	8	8	8	8	1	8	5
Gato Ridge	Monterey	Mean	9226	30	1789	3207	29	4004	45	15	50
		Std. Dev	1041	14	540	374	11	718	8	10	44
		Count	49	38	39	49	49	39	4	39	31
	Sisquoc	Mean	21000								
		Std. Dev									
		Count	1	0	0	0	0	0	0	0	0

Figure 1.2-5, Cat Canyon Oil Field TDS by Area and Formation graphically shows the highest and lowest Expected Values as well as the Design Average. Refer to **Appendix II, Formation Water Analysis** details on statistical review of the data.

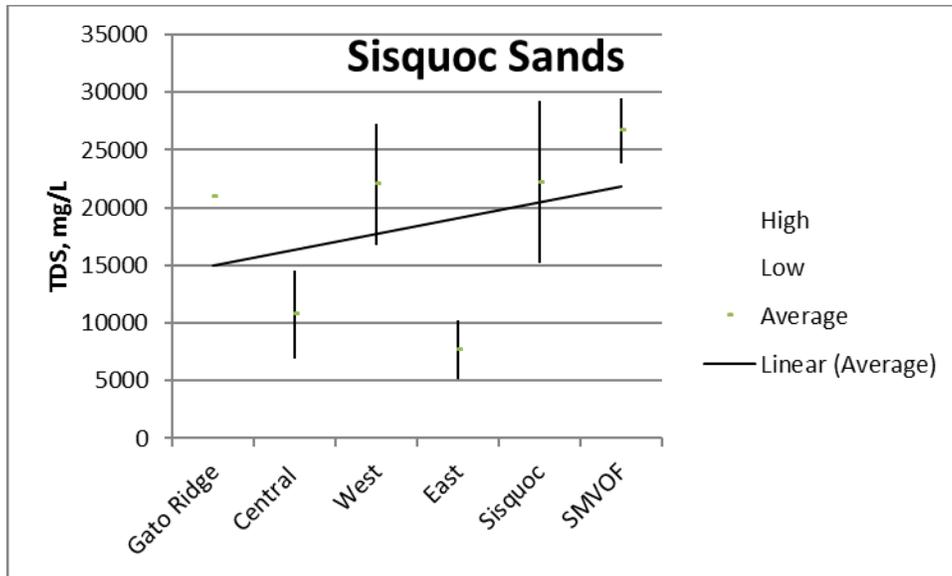


Figure 1.2-5

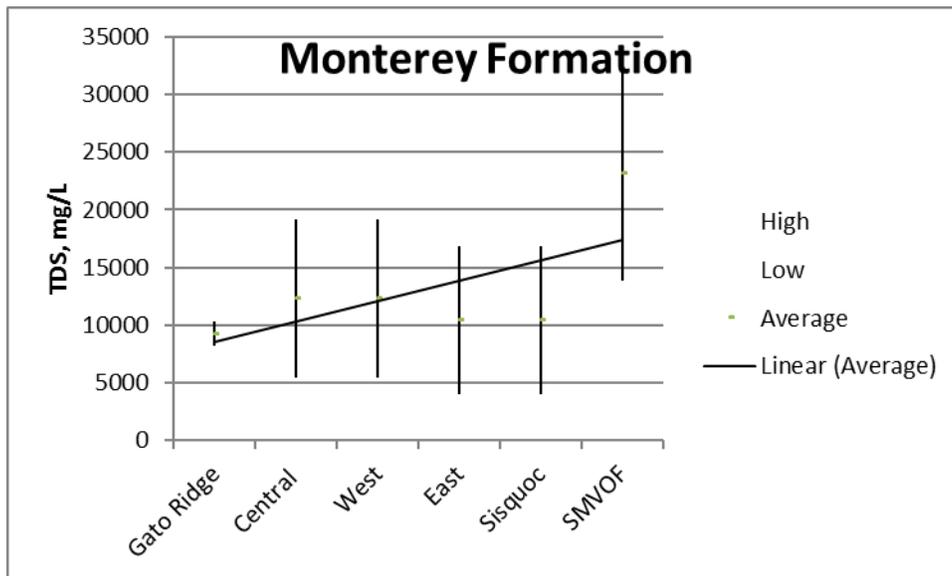


Figure 1.2-5

1.2.2 Nearest Community Well Location

The proposed Aquifer Exemption Expansion Study Area covers a wide area with distinct oil field relationships to communities. Gato Ridge, which extends to the southeast of the main body of the field, is closer to Los Alamos CDP while the remainder of the areas are closer to the communities of Garey and Sisquoc.

Gato Ridge Area

None of the community service provider’s drinking water wells were found to be completed within the proposed aquifer exemption area in the Gato Ridge Area of the Cat Canyon Oil Field. The nearest community is Los Alamos CDP. The general distance to Los Alamos CDP from Gato Ridge Area Centrus is 3.5 miles to the south by southeast.

Central, East, West and Sisquoc Areas

The community of Sisquoc is served by Golden State Water Company which has legacy wells within the community (which in turn is inside the proposed Aquifer Exemption Expansion Study Area). The community of Garey is served by individual residential wells, ((no name given), 2017).

Table 1.2-2, Water Wells Serving Target Communities identifies the nearest community service wells to the study area.

Table 1.2-2: Water Wells Serving Target Communities					
Los Alamos CDP GeoTracker GAMA Community Well Locations ¹					
DATASET	WELL ID	WELL NAME	STREET	LATITUDE	LONGITUDE
DHS	W0604210002	4210002-003	Bell St.	34.74075	-120.27036
DHS	W0604210002	4210002-004	Price Ranch	34.73937	-120.26542
DHS	W0604210002	4210002-005	St Joseph’s	34.74710	-120.28228
Sisquoc CDP Community Well Locations ²					
GSWC	Sisquoc #1	4200560-009	Foxen Cyn Rd.	34.864748	-120.29552
GSWC	No Facilities	4200560-001 and -007	Foxen Cyn. Rd	Same	Same

1.2.2.1 Gato Ridge Area-Los Alamos Community Services District

The nearest community service wells are in Los Alamos, CA in the San Antonio Ground Water Basin and DAU 73 (San Antonio Valley) in Santa Barbara County. The Los Alamos Community Services District is an independent special district.

- Service Area – 1 square mile
- Population served – 1,890 (2010 Census)
- Connections
 - Residential – 469
 - Commercial – 21
 - Multi-family – 27
 - Industrial – 0
 - Landscape – 14
 - Other – 12
 - Total - 543
- Sources
 - Groundwater – 96,675,000 gal (~296.8 AF)
- Distribution system – The District’s water system consists of 3-groundwater wells and 1-square mile of distribution system that consists of pipes ranging in size from 6 to 12

¹ Per LACDP

² Per Blochman SD Superintendent (D. Brown) and Golden State Water Company Annual Report Plant Facility Index.

inches. The District has 3-storage tanks, a 1-million gallon above-ground tank, a 500,000 gallon partially buried reservoir, and a 200,000 gallon above ground tank for a total storage volume of 1.7 MG. The District is responsible for the operation and maintenance of the water wells and entire distribution system, including all fire hydrants, air vacs, blow offs, and storage tanks.

- Water Conservation-- The District is not required to prepare an Urban Water Management Plan and is not a signatory of the CUWCC MOU and therefore no detailed information regarding water conservation efforts is available. The County Water Agency implements a regional water conservation program. (County, 2013)

The nearest community serving wells are three wells in Los Alamos CDP, CA—approximately 3 miles southwest of the Gato Ridge Area of Cat Canyon Oil Field, (GeoTracker, 2017), (Bernard, Los Alamos CDP, Director Public Works, 2017). **Figure 1.2-8, Los Alamos Community Services District Territory Map** shows the service territory of the nearest community.

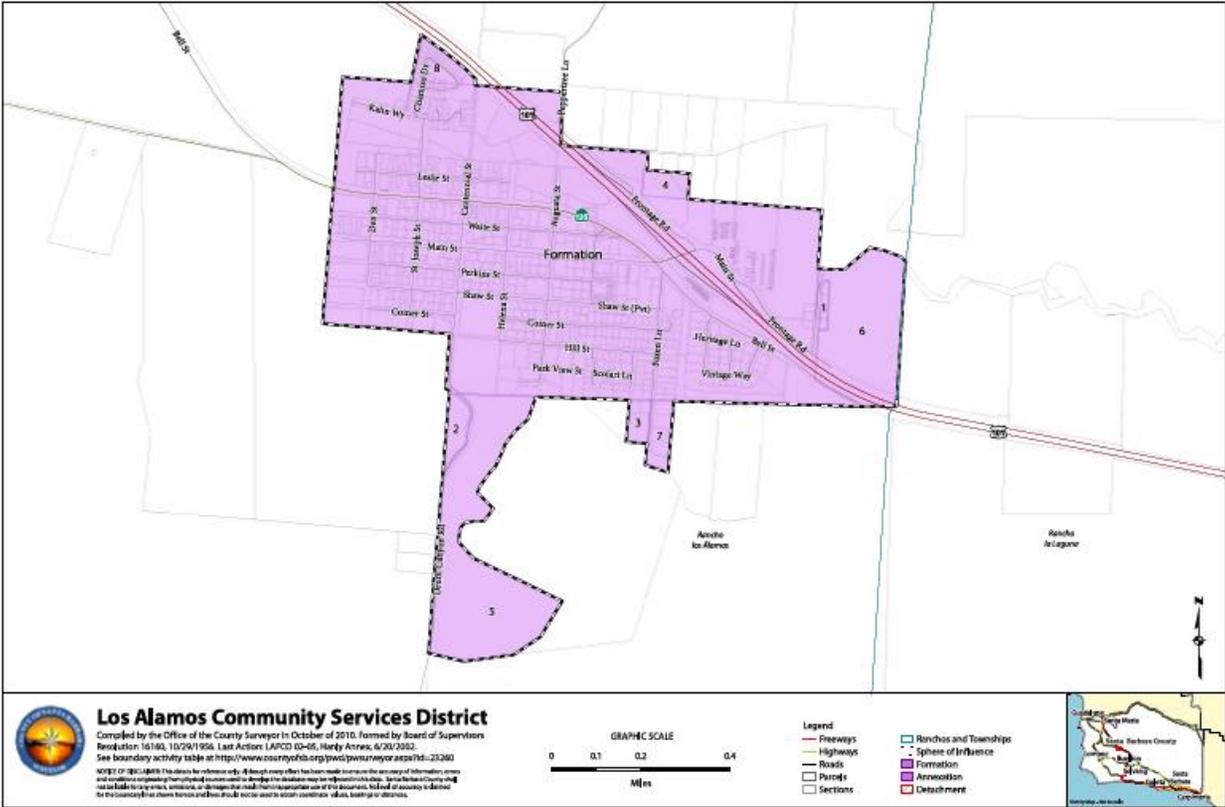


Figure 1.2-8

1.2.2.2 *Cat Canyon- Central, East West and Siquoc Areas- Golden State Water Company (Orcutt and Sisquoc)*

Golden State Water Company

Political Description - Supply Sources, Delivery systems, Other Responsibilities. It is a private water Company serving unincorporated communities of Orcutt, Sisquoc and Garey. Service Area - The Orcutt System is located in Santa Barbara County and serves an unincorporated portion of the county south of the City of Santa Maria. Separate systems serve the communities of Sisquoc and Garey. The service area is primarily characterized by residential and commercial land use. No changes in the boundaries of the area, served by the Company in the Santa Maria Valley, have occurred since the 2003 Supply and Demand Report.

- Service Area-
- Population served – 28,761 (2010 Census)
 - Connections – (2010)
 - Single Family – 10,587
 - Multi-family – 117
 - Commercial – 166
 - Industrial – 11
 - Institutional/Gov – 70
 - Landscape – 137
 - Ag – 1
 - Other – 71
 - Total – 11,160
- Sources – (2010, in af/yr)
 - Purchased/Assigned water from Santa Maria (SWP water via CCWA) – 92
 - Groundwater (Santa Maria Basin) – 7,207
 - Total – 7,299
 - Distribution system – 125.4 Miles
- Storage system – The Company makes use of the groundwater basin for storage.
- Water Conservation- In association with the changes in legislation, the Company has formalized its reporting procedures and submits biannual reports to the CUWCC. Because any costs associated with implementing measures associates with SBX7-7 must be approved by the Public Utilities Commission, the Company is waiting for the outcome of a pending rate increase request before implementing new water efficiency measures. (County, 2013)

5 miles from Cat Canyon Areas Centrus.

State Water Project Allocations for Golden State Water Company (Orcutt area):

- Drought Allocation 50 ac-ft
- Table A Amount 500 ac-ft

1.2.2.3 *Agricultural Wells*

There are agricultural and rural domestic water wells in the study area (GeoTracker, 2017).

Table 1.2-3 identifies the wells in the vicinity.

Table 1.2-3 Water Well - Water Quality Information

WELL ID	WELL NAME	APPROXIMATE LATITUDE	APPROXIMATE LONGITUDE	WELL ID	WELL NAME	APPROXIMATE LATITUDE	APPROXIMATE LONGITUDE
USGS-344517120220701	USGS-344517120220701	34.747	-120.367	AGL020007625	RANCH12_I	34.864	-120.397
USGS-344755120220501	USGS-344755120220501	34.797	-120.342	AGL020003809	CLARK AVENUE WE	34.876	-120.372
USGS-344448120134601	USGS-344448120134601	34.751	-120.235	AGL020003772	HOUSE WELL	34.901	-120.299
USGS-344532120205001	USGS-344532120205001	34.757	-120.352	AGL020012022	BRADLEY NORTH	34.901	-120.397
AGL020004512	LOS ALAMOS #1	34.751	-120.347	AGL020010047	2110_I	34.907	-120.338
08N33W20R001S	08N33W20R001S	34.7547	-120.3707	AGL020004970	RANCH5_IRR	34.902	-120.305
08N33W21L002S	08N33W21L002S	34.7566	-120.359	10N33W36A001S	10N33W36A001S	34.9064	-120.2993
08N32W30C002S	08N32W30C002S	34.7483	-120.2907	AGL020003933	RCH 20 DOM	34.864	-120.298
AGL020000788	#1 OLD	34.763	-120.392	AGL020004973	RANCH6_IRR	34.861	-120.395
USGS-344532120232202	USGS-344532120232202	34.75	-120.387	AGL020014942	DOMESTIC 2	34.907	-120.387
AGL020004330	MISSION_D	34.76	-120.296	10N33W35R002S	10N33W35R002S	34.8939	-120.316
USGS-344453120180701	USGS-344453120180701	34.742	-120.295	AGL020020582	RANCH7_DOM	34.906	-120.382
AGL020007720	PRIMARY	34.91	-120.375	USGS-345341120233702	USGS-345341120233702	34.891	-120.4
AGL020014793	RANCH5_IRR	34.874	-120.326	USGS-345056120135501	USGS-345056120135501	34.854	-120.239
T1000009096	FWWW#2	34.855559	-120.343978	09N32W32K001S	09N32W32K001S	34.8111	-120.2679
AGL020004331	BRYON_DOM	34.857	-120.243	AGL020013772	CJJ RANCH 13	34.89	-120.353
AGL020000998	IW 1	34.896	-120.369	AGC100000001	CCGC_0580	34.909	-120.385
AGL020004326	CAMBRIAE_I	34.868	-120.261	AGL020020622	IRRIGATION	34.91	-120.371
AGL020010428	RANCH 1	34.91	-120.354	AGL020017362	DEWLSON	34.884	-120.36
USGS-345238120205301	USGS-345238120205301	34.87	-120.357	AGL020009964	3016_I	34.898	-120.345
USGS-345155120170001	USGS-345155120170001	34.861	-120.281	AGL020000720	ONTIVEROS	34.864	-120.329
USGS-345024120181801	USGS-345024120181801	34.837	-120.304	AGL020008051	UPPER WELL	34.876	-120.375
09N33W06G001S	09N33W06G001S	34.8905	-120.3893	AGL020009742	TGNZNI_IRR	34.881	-120.31
09N33W12R001S	09N33W12R001S	34.8658	-120.2979	AGL020013885	RANCH 6 #1	34.867	-120.349
09N32W17G001S	09N32W17G001S	34.858	-120.2696	AGL020024482	CHAVEZ	34.897	-120.387
AGL020023802	MCT AG 1	34.878	-120.383	USGS-345423120175001	USGS-345423120175001	34.898	-120.297
AGL020018702	44ELECTR_I	34.847	-120.25	AGL020010426	RANCH5_IRR	34.893	-120.335
AGL020004105	RNCH10_IRR	34.845	-120.234	AGL020003913	RCH 14 IRR	34.879	-120.301
AGL020001340	DOMESTIC WELL	34.885	-120.289	AGL020004898	RANCH 5	34.894	-120.335
AGL020001204	GOODCHILD	34.866	-120.273	AGL020003800	TELEPHONE WELL	34.902	-120.382
AGL020028118	SIERRA MAD PRIM	34.899	-120.362	AGL020008571	BRADLEY SOUTH	34.89	-120.391
AGL020026812	RANCH 28 DOM	34.907	-120.377	AGL020016062	CLARKR_IRR	34.872	-120.38
AGL020023042	RCH 8 PRIMARY	34.866	-120.285	USGS-345247120171801	USGS-345247120171801	34.881	-120.288
AGL020005721	SISQUOC_D	34.837	-120.213	10N33W35C001S	10N33W35C001S	34.9072	-120.3229
AGL020010502	WELL	34.876	-120.366	AGL020000990	DOMESTIC WELL	34.773	-120.275
USGS-345129120160301	USGS-345129120160301	34.86	-120.268	USGS-344522120224901	USGS-344522120224901	34.753	-120.379
USGS-345152120162801	USGS-345152120162801	34.858	-120.272	USGS-344518120214501	USGS-344518120214501	34.748	-120.362
USGS-345320120184201	USGS-345320120184201	34.887	-120.311	USGS-344414120140501	USGS-344414120140501	34.741	-120.231
10N33W33H001S	10N33W33H001S	34.9016	-120.349	AGL020003594	WELL 2	34.765	-120.388
USGS-345220120221901	USGS-345220120221901	34.875	-120.364	AGL020004388	WELL 1	34.76	-120.299
AGL020006300	WELL 1	34.886	-120.35	AGL020004541	EL CAMINO DW #1	34.762	-120.316
USGS-345201120164901	USGS-345201120164901	34.867	-120.29	AGL020003431	DOM/IRR	34.757	-120.236
USGS-345129120160201	USGS-345129120160201	34.865	-120.268	AGL020003231	DOMESTIC	34.743	-120.201
USGS-345242120201801	USGS-345242120201801	34.883	-120.341	AGL020000976	IW3	34.797	-120.329
USGS-345106120225601	USGS-345106120225601	34.849	-120.388	AGL020004975	RANCH7_IRR	34.74	-120.297
09N33W05B001S	09N33W05B001S	34.8939	-120.3752	USGS-344533120235301	USGS-344533120235301	34.752	-120.393
09N33W02A007S	09N33W02A007S	34.8903	-120.3138	08N32W30H007S	08N32W30H007S	34.7453	-120.2813
AGL020003972	MAHONEY RANCH 7	34.887	-120.356	08N32W30H006S	08N32W30H006S	34.7461	-120.2815
AGL020009343	RANCH 1 IRR	34.903	-120.37	AGL020001230	DOMESTIC WELL	34.754	-120.264
AGL020015282	SIERRA_IRR	34.895	-120.349	USGS-344524120212502	USGS-344524120212502	34.763	-120.367
09N33W18R001S	09N33W18R001S	34.8516	-120.3815	USGS-344544120204701	USGS-344544120204701	34.756	-120.348
09N33W09A001S	09N33W09A001S	34.8772	-120.3502	USGS-344554120180201	USGS-344554120180201	34.768	-120.308
USGS-344835120152701	USGS-344835120152701	34.809	-120.255	AGL020004845	RANCH1_IRR	34.746	-120.338
USGS-345324120184201	USGS-345324120184201	34.892	-120.317	W0604210002	4210002-003	34.740747	-120.270364
09N32W07R001S	09N32W07R001S	34.8669	-120.2824	AGL020007472	MAIN WELL	34.742	-120.256
USGS-345326120231401	USGS-345326120231401	34.888	-120.383	AGL020004324	GEOFFREY_D	34.745	-120.378
USGS-344840120155701	USGS-344840120155701	34.813	-120.26	SCRC-H12	SCRC-H12	34.74	-120.222
USGS-345157120174501	USGS-345157120174501	34.859	-120.299	USGS-344443120165901	USGS-344443120165901	34.751	-120.288
AGL020004966	RANCH4_IRR	34.891	-120.311	AGL020001186	DANS HOUSE	34.742	-120.237
AGL020005047	RANCH2_IRR	34.887	-120.357	AGL020003826	MONIGHETTI	34.768	-120.347
W0604210022	4210022-003	34.869669	-120.374142	AGL020017282	MONIGHET_I	34.752	-120.382
W0604200800	4200800-002	34.904579	-120.390524	USGS-344441120124901	USGS-344441120124901	34.751	-120.212
W0604200930	4200930-002	34.880817	-120.260129	08N33W20Q001S	08N33W20Q001S	34.755	-120.3715
W0604200560	4200560-009	34.865793	-120.296117	08N32W26R001S	08N32W26R001S	34.7491	-120.2072
AGL020012542	RANCH7_IRR	34.889	-120.392	08N33W14R001S	08N33W14R001S	34.7639	-120.3179
AGL020002641	WELL 1	34.879	-120.313	08N33W24B001S	08N33W24B001S	34.7628	-120.3032
AGL020009363	DOM1	34.894	-120.357	08N33W25B002S	08N33W25B002S	34.748	-120.304
USGS-345211120222301	USGS-345211120222301	34.869	-120.38	AGL020004945	WELL 1	34.763	-120.278
USGS-345327120223001	USGS-345327120223001	34.896	-120.367	USGS-344558120172201	USGS-344558120172201	34.773	-120.293
09N33W02H009S	09N33W02H009S	34.8889	-120.3138	USGS-344523120224801	USGS-344523120224801	34.749	-120.381

AGL020003912	RANCH8_I/D	34.909	-120.364		AGL020004520	LOMA VERDE #1	34.806	-120.34
AGL020014955	RCH 23 PRIMARY	34.841	-120.374		08N33W20Q002S	08N33W20Q002S	34.755	-120.3715
AGL020003440	R1W1	34.9	-120.372		08N33W24R001S	08N33W24R001S	34.753	-120.2999
AGL020009723	TRAVIS_IRR	34.88	-120.307		AGL020003593	WELL 1	34.749	-120.385
AGL020017803	BRADLEY TELE	34.896	-120.393		AGL020004396	DW	34.777	-120.313
AGL020020502	FREITAS_IR	34.885	-120.335		08N33W22N001S	08N33W22N001S	34.7541	-120.3463
AGL020023822	MRS AG 3	34.86	-120.236		08N33W19E001S	08N33W19E001S	34.7595	-120.3856
USGS-345210120205001	USGS-345210120205001	34.877	-120.342		08N32W30E001S	08N32W30E001S	34.7455	-120.2836
USGS-345206120210001	USGS-345206120210001	34.863	-120.344		08N32W18P001S	08N32W18P001S	34.7661	-120.2915
09N33W08L001S	09N33W08L001S	34.8697	-120.3752		AGL020027955	RANCH36_D	34.744	-120.384
AGL020001006	IW1	34.905	-120.358		AGL020018683	BACHELD7_I	34.748	-120.376
USGS-345338120222301	USGS-345338120222301	34.889	-120.38		08N33W21G001S	08N33W21G001S	34.7589	-120.3574
09N33W08K001S	09N33W08K001S	34.868	-120.3644		08N32W29E001S	08N32W29E001S	34.745	-120.2771
AGL020000761	TASTING_D	34.85	-120.259		09N33W07F001S	09N33W07F001S	34.7561	-120.3949
W0604200851	4200851-010	34.852465	-120.379898		08N33W23P001S	08N33W23P001S	34.7533	-120.3265
AGL020003907	RCH 12_IRR	34.873	-120.308		08N33W19L003S	08N33W19L003S	34.7559	-120.3812
AGL020001349	DBSM 1	34.87	-120.327		AGL020005262	KICK ON VINEYAR	34.758	-120.38
AGL020003803	GAREY WELL	34.88	-120.307		08N33W19H001S	08N33W19H001S	34.7595	-120.3724
AGL020000716	CLARK	34.88	-120.372		08N33W20K001S	08N33W20K001S	34.7555	-120.3721
USGS-345148120204201	USGS-345148120204201	34.866	-120.348		08N32W30G001S	08N32W30G001S	34.7453	-120.2852
09N32W33M001S	09N32W33M001S	34.8097	-120.2596		AGL020001197	DON MIGUEL	34.74	-120.256
09N33W01L001S	09N33W01L001S	34.8822	-120.3088		USGS-344517120214301	USGS-344517120214301	34.748	-120.365
AGL020004686	RANCHA_IRR	34.903	-120.342		08N32W30K001S	08N32W30K001S	34.7439	-120.2849
AGL020000717	TUNNEL	34.851	-120.328		AGL020010504	WELL 2	34.757	-120.395
AGL020027621	RDM 40 BRADLEY	34.886	-120.384		08N33W21A002S	08N33W21A002S	34.7653	-120.3496
AGL020027374	PRIMARY	34.836	-120.369		08N33W21M001S	08N33W21M001S	34.755	-120.3646
AGL020023103	RCH 33 PRIMARY	34.899	-120.398		08N33W25D003S	08N33W25D003S	34.7491	-120.3005
AGL020004864	RANCH 2	34.891	-120.303		AGL020004334	SAINZ_DOM	34.755	-120.323
09N33W02A001S	09N33W02A001S	34.89	-120.3138		SCRC-H13	SCRC-H13	34.799	-120.322
09N33W15D001S	09N33W15D001S	34.8633	-120.3471		08N33W20M001S	08N33W20M001S	34.7569	-120.3824
09N32W17F003S	09N32W17F003S	34.858	-120.2693		08N33W03L001S	08N33W03L001S	34.7986	-120.3424
AGL020020142	GULRTE_IRR	34.884	-120.313		08N33W23E001S	08N33W23E001S	34.7591	-120.3299
AGL020007803	DUTRA_IRR	34.867	-120.289		08N33W29D001S	08N33W29D001S	34.7505	-120.3846
AGL020000981	IW1	34.899	-120.322		08N33W29L001S	08N33W29L001S	34.7425	-120.3779
AGL020023782	MO AG 2	34.859	-120.32		AGL020004328	MISSIONP_I	34.747	-120.332
AGL020007835	AG WELL	34.879	-120.386		08N33W19R001S	08N33W19R001S	34.7523	-120.3724
AGL020004101	RNCH14_IRR	34.869	-120.286		08N32W30K002S	08N32W30K002S	34.7439	-120.2849
08N33W19L002S	08N33W19L002S	34.758	-120.3971		08N32W26G002S	08N32W26G002S	34.7447	-120.2157
08N33W15Q001S	08N33W15Q001S	34.7663	-120.3267		08N33W19G001S	08N33W19G001S	34.7589	-120.3915

Agricultural water use now accounts for approximately 75 percent of all water demand in Santa Barbara County; some of the water used for agricultural returns as groundwater recharge. Agricultural water supplies are typically obtained from private groundwater wells; some water purveyors may provide agricultural water from surface water or from state water project allocations as well.

Source	Demand (AFY)
Carpinteria Valley Water District	1,582
Goleta Water District	2,387
La Cumbre Mutual Water Company	1036
Montecito Water District	550
Santa Ynez River Water Conservation District Improvement District No. 1	2,404
Private Wells, Cuyama Valley	15,300
Private Wells, San Antonio Valley	17,020
Private Wells, Santa Maria Valley	117,852
Private Wells, Santa Ynez Valley	59,980
Total	217,328

Irrigation technologies have improved, reducing the amount of water used by some irrigated crops. These improvements include drip irrigation, seedling propagation in controlled greenhouse environments, laser leveling of fields, irrigation based on precise crop need, and use of tailwater recovery systems in furrow-irrigated fields. (County, 2013)

Figure 1.2-6, Los Alamos CSD, Cost per AF of Water vs. Average Daily Water Use and Figure 1.2-7, Golden State Water Company, Cost per AF of Water vs. Average Daily Water Use shows the average cost for water, the average is approximately \$35/AF or \$107.38/ million gallons. Delivery and Service costs are typically 60% to 68% of the all-in cost for a metered delivery to a residence on a national basis, (Guidelines Appendix G); the all-in agricultural costs for water delivered at a given farm’s well head are estimated to be the 50% of the Los Alamos CSD water cost or \$53.69/million gallons, (County, 2013).

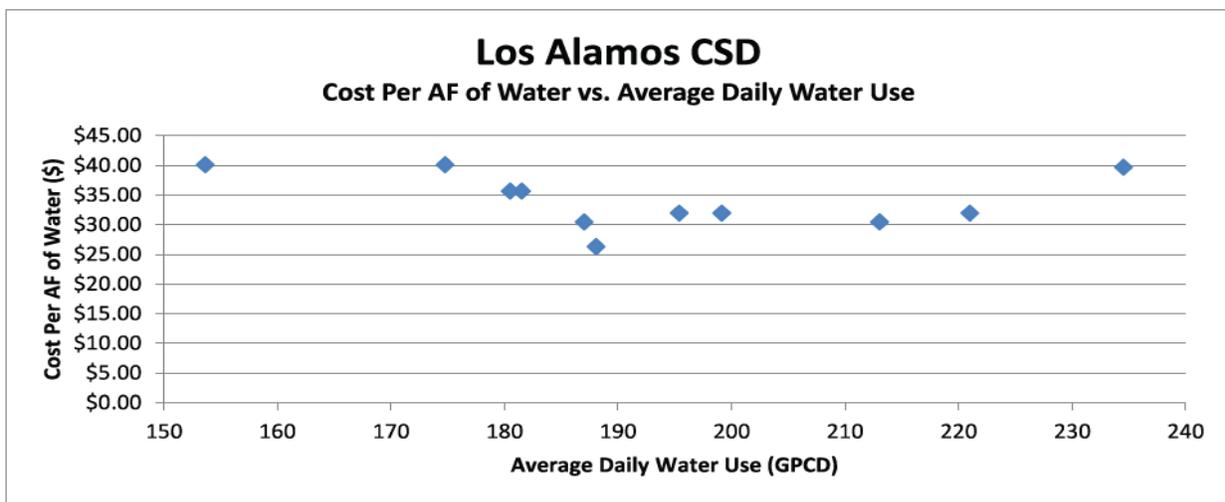


Figure 1.2-6

From Santa Barbara IRWMP

The all-in average residential customer pays \$460/yr-Household in the LACSD, (Los Alamos Community Services District, 2016).

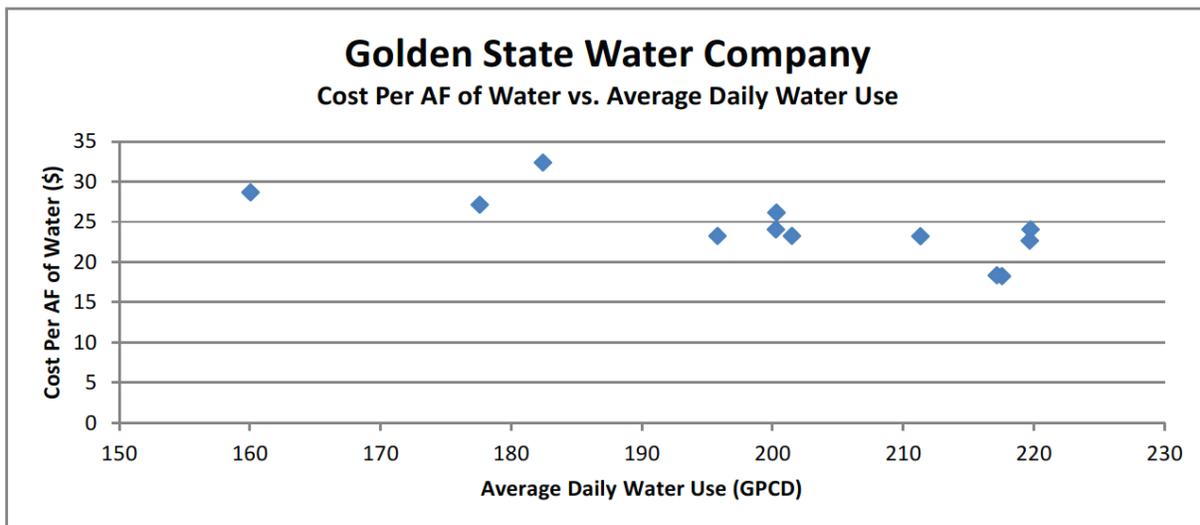


Figure 1.2-7

From Santa Barbara IRWMP

The all-in average residential customer pays \$617/yr-Household in the GSWC: Santa Maria Territory, (Golden State Water Company, 2014).

1.2.2.4 Oil Field Service Water Wells

In the past several oil companies have operated water supply wells in the study area for steam generation in the productive areas. The oil field source water wells that serve steam programs in the oil field surrounding the study area are shown on **Figure 1.2-12, Oil Operation Source Wells**.

1.2.3 Regional Water

A detailed discussion of the regional groundwater is found in the Aquifer Exemption Expansion Application Study, Section 5.

1.2.3.1 Water Quality

San Antonio Valley

The San Antonio Valley is approximately 29 miles long by seven miles wide at its widest. It is situated between the Solomon-Casmalia Hills to the north, the Purisima Hills to the south, the Burton Mesa to the west and the westernmost flank of the San Rafael Mountains to the east. The Watershed is approximately 130 square miles and the Groundwater Basin within the Valley is about 110 square miles. It is a single Drainage Analysis Unit (DAU).

Water quality studies conducted by the USGS in the late 1970s indicated an average TDS concentration within the basin of 710 mg/L, with concentrations generally increasing westward. The cause of the westward water quality degradation is thought to be the accumulation of lower quality water from agricultural return flow and the dissolution of soluble minerals. The highest TDS concentration (3,780 mg/L) was found in the extreme western end; the lowest concentration (263 mg/L) was found at the extreme eastern end. Analyses compiled for samples taken between 1958 and 1978 indicate that groundwater quality remained fairly stable during that period.

Analyses of water sampled in 1993 for several wells show only slight increases in TDS since the previous study. There is evidence that poor quality connate waters exist within fracture zones of the bedrock and that this water might be induced into overlying strata through excessive pumping. There is no evidence of seawater intrusion in the basin, nor is the basin considered susceptible to seawater intrusion due to the consolidated rock that separates the basin from the ocean, (Gibbs, 2012).

Santa Maria Valley

The Santa Maria Valley is drained by the Sisquoc, Cuyama, and Santa Maria Rivers and Orcutt Creek. Tri-Cities Mesa and Arroyo Grande Plain are drained by Arroyo Grande and Pismo Creeks. Nipomo Valley is drained by Nipomo Creek into the Santa Maria River. It is over 100 miles long and over 30 miles wide and it extends beyond Santa Barbara County to the north and the east. It is also broken into multiple Drainage Analysis Units (DAUs). The basin also underlies Nipomo and Tri-Cities Mesas, Arroyo Grande Plain, and Nipomo, Arroyo Grande and Pismo Creek Valleys (DWR 2002). The basin is bounded on the north by the San Luis and Santa Lucia Ranges, on the east by the San Rafael Mountains, on the south by the Solomon Hills and the San Antonio Creek Valley Groundwater Basin, on the southwest by the Casmalia Hills, and on the west by the Pacific Ocean.

Groundwater character in this basin is variable and classified as a mixed-ion type, where there is no dominant cation or anion. The central part of the basin in San Luis Obispo County is chiefly calcium-magnesium sulfate; whereas, groundwater in the northwestern part of the basin is more commonly calcium bicarbonate or calcium sulfate in character. TDS concentrations vary throughout the basin, but tend to increase from east to west and increase toward the center of the basin beneath the cities of Santa Maria and Guadalupe in Santa Barbara County. TDS concentrations also increase southward, away from the recharge area of the Santa Maria River. East of Guadalupe, TDS concentrations increased to more than 3,000 mg/L in 1975 (SBCWA 1999; 2001). Water from 78 public supply wells has an average TDS content is 598 mg/L and ranges from 139 to 1,200 mg/L, (California Department of Water Resources, 2016). Annual precipitation ranges from 13 to 17 inches, with an average of 15 inches.

Median Ground Water Objectives for the two basins and sub basins are:

Table 1.2-5: Median Ground Water Objectives, mg/L, (Central Coast Regional Water Quality Control Board, 2011)					
Sub-basin/Sub-Area	TDS	B	Na	Cl	SO ₄
San Antonio Creek	600	0.2	100	150	150
Santa Maria Upper Guadalupe	1000	0.5	230	165	500
Lower Guadalupe	1000	0.2	90	85	500
Lower Nipomo Mesa	710	0.15	90	95	250
Orcutt	740	0.1	65	65	300
Santa Maria	1000	0.2	105	90	510
Cuyama Valley	1500	0.4	--	80	--

1.2.3.2 Water Management: Santa Barbara County Integrated Water Management Plan

The Santa Barbara County Integrated Water Management Plan discourages overdraft conditions. (County, 2013) The San Antonio Valley Basin receives little rain and minimal recharge by surface collection or from rivers, creek and streams, (County, 2013). The study area is in DAU 71 and DAU 73.³

2 Summary

In order to better focus the Treatment Feasibility for determination of Aquifer Exemption Status Economic models were limited to three cases: the low case or best water quality case, the average Sisquoc Formation case, and the a Monterey Formation Water case.

The Low Case is based on the assumption that any given formation can yield water that is reflective of the condensate that may remain (due to increased water storativity after all producible oil is depleted) in the Sisquoc Sands in the Sisquoc Area. This post steam case (which is not considered a likely case but remains conservative for Feasibility Study) used the lowest formation value for TDS (5,707mg/L) with the average boron value (25 mg/L) from the Sisquoc Area; it was applied as the conservative Low TDS Case regardless of area or formation, refer to Section 6, Sensitivity Analysis.⁴ The next two cases are field wide formation averages. Table 2.0-1 below delineates the case and the average TDS in mg/L.

Table 2.0-1: Field Wide Average [TDS] and [B] after Review, mg/L		
	TDS	Boron
Low Case	5,707	25
Sisquoc	22,216	27
Monterey	9,226	30

³ DAU 73-“San Antonio: Estimated projections for San Antonio DAU 73 indicate that water supplies for this area are not sufficient to meet current or projected demand. The estimated shortfall for the DAU stated in this report is approximately 20,000 acre-feet per year is for the entire DAU area which includes a defined groundwater basin area and additional area in the northwest portion of the DAU; thus, the estimate for the DAU includes a groundwater basin that has an estimated safe yield and additional area outside the define groundwater basin. The rate of use is anticipated to continue at the similar rate over time. The agricultural land use information provided for this report indicates a substantial amount of vineyard acres in the central portion of DAU 73 and a substantial amount of rotational vegetables in the in northwest portion of DAU 73, adjoining DAU 71. Importing State Water Project water has significantly reduced the overall DAU water supply shortfall; however, additional water supplies are still needed. The County of Santa Barbara is considering undertaking a more detailed study for this area. Some of the shortfall will be reduced over time due to expected water conservation efforts to reduce the per capita water demand by Los Alamos CSD, Vandenberg AFB and the private M&I and agricultural water pumpers.” From SBIWMP

⁴ This design case (based on the condensate from the Sisquoc Area) represents a low hurdle for the Cat Canyon Oil Field. This analysis alone would be sufficient to determine if any area or formation is suitable for USDW or agricultural application. The other two higher TDS cases simply allow the assessment of each subject formation in a more specific manner.

EPA and DOGGR have issued a joint checklist to ensure completeness of the AE. This section addresses or references data that conforms to the following check list elements:

- Checklist item -40 CFR 146.4(b)(2)
 - Availability of less costly and more readily available alternative supplies.
 - Adequacy of alternatives to meet present and future needs.
 - Costs for treatment and/or development associated with use of the aquifer.
 - An economic evaluation that considers: distance to PWS; water sources; availability, quantity and quality of alternative water supply sources; future water supply needs in the area; depth of the aquifer; and water quality.
- Checklist item -40 CFR 146.4(b)(3)
 - Concentration, type, and source of contaminants.
 - If contamination is a result of a release, whether contamination source has been abated.
 - Extent of the contaminated area
 - Probability that the contaminant plume will pass through the proposed exempted area.
 - Ability of treatment to remove contaminants from ground water.
 - Current and alternative water supplies in the area.
 - Costs to develop current and future water supplies (e.g., construction, transportation, treatment costs).
 - Projections of future use of the aquifer.
- Checklist item -40 CFR 146.4(c)
 - Basis for determination that the TDS is between 3,000 and 10,000 mg/I (for example, are current, detailed analysis reports provided, from a lab that is certified in California).
 - Basis for determination that the aquifer is not reasonably expected to supply a PWS.
 - Information about water quality and availability.
 - Potential PWS use of the aquifer, including description of current sources in the area, the adequacy of current sources to supply future needs, population projections, economy, future technology, and other available water supply sources in the area.

USEPA studied and issued guidance on methodologies to assess the future worth of certain aquifers that may or may not serve as a public source of drinking water. Typically, water services are treated as utilities and regulated by the Public Utility Commission as to prudent expenditures which are passed on to captive customers (ratepayers). To prevent the inadvertent inclusion of unreasonably expensive treatment systems due to commitments made to process water of marginal quality as opposed to other least cost alternatives USEPA specifies three alternative tests to determine treatment feasibility for the determination of aquifer status; the questions EPA test against are:

- 1) Will the proposed aquifer treatment cause households to have a pay an unreasonable amount of their household income on a percentage basis?
- 2) Will the proposed aquifer treatment cause households to have a pay an unreasonable amount of their household income on an incremental dollar's basis? and
- 3) Will the proposed aquifer treatment cause households to have a pay too much more for their water service on an Annual Water Bill basis?

Residential Drinking Water

The summary **Table 2.0-2, Residential Economic Feasibility**, below shows three cost models to treat native formation water to drinking water requirements for:

1. The Low Case in all areas (including the Monterey),
2. The Sisquoc Sands in all areas, and
3. The Monterey Formation in all areas.

In the context of the percentage of per Household Income: The case having the lowest cost to a household is the facility design using the best economy of scale (as if serving 1,799 households) applied to the production of water to serve the entire 1799 households as consumers at the local per capita rate.

Even under the most optimistic circumstances there are no cases where the Cat Canyon Sisquoc Sands or Monterey Formation waters can be produced, treated and delivered in a cost effective manner. In fact, for the lowest cost case, assuming condensate was present in sufficient quantities near the location of the new well (Low TDS Case), the all-in cost to the households would be 12 to 16 times the incremental threshold established by EPA. The water would also exceed the 2% income threshold established by the State under AB2334, thus requiring state subsidies.

Table 2.0-2: Economic Feasibility Summary-to Treat Formation Water for Residential Use

	Per Household Rate Burden (Annualized \$/HH)					Income Burden		Increment Sensitivity			Subsidy
	Wells	Facilities	Piping	Operational	Total	Santa Barbara County	Los Alamos CSD	Threshold Increase	Current Water Source Rate (LACSD)	Current Water Source Rate (GSWC)	AB2334 High Cost Subsidy Eligibility
Economic Base						\$89,903.00	\$83,499.00	\$450.00	\$460.00	\$617.00	\$83,499.00
Low Case 2000 feet (Average Well Depth)											
1799 Household Case	\$311.00	\$1,456.31	\$122.35	\$5,074.15	\$6,963.81	8%	8%	15.48	\$16.14	12.29	8%
Sisquoc Sands 2000 feet (Average Well Depth)											
1799 Household Case	\$311.00	\$1,905.93	\$122.35	\$6,528.98	\$8,868.26	10%	11%	19.71	20.28	15.37	10%
Monterey Formation 3000 feet (Average Well Depth)											
1799 Household Case	\$466.50	\$1,464.40	\$122.35	\$5,326.28	\$7,379.53	8%	9%	16.40	17.04	12.96	8%

Income data from: (US Bureau of Labor and Statistics)

The planning level analysis costing was based on the assumption that the facility would be used at full delivery capability by distributing any excess capacity to other, yet to be defined, residential service areas in the Santa Barbara County Integrated Water Management Plan area. Otherwise, the per-household-cost would be on the order of tens of thousands of dollars per household-yr for the community of Los Alamos CDP; clearly exceeding the Willingness-to-Pay criteria.

EPA guidance would dictate that the most rigorous comparison be based on an All-In cost. The cost of surface easements would be market-based and the issue of split estate for the entire confined portion of the subject formation is either a takings matter, a settled trespass of a specific lease (where a water well is producing and wasting or selling oil owned by a mineral rights owner), or a case-by-case contractual matter for the entire confined portion of the subject formation. These substantial and unresolved cost elements (along with Distribution and Service) are not included in the lower value used in the test. No effort was made to include these tangible costs provided that the EPA criteria were met with the easier to obtain lesser cost (i.e., minus the other otherwise unknown easement and split estate costs as well as Distribution and Service).

Delivery and Service costs are typically 60% to 68% of the all-in cost for a metered delivery to a residence on a national basis (Guidelines Appendix G); however, local costs factored into the Delivery and Services costs would be higher.

Agricultural Use

The summary **Table 2.0-3, Agricultural Service Economic Feasibility**, below shows three cost models to treat native formation water to drinking water requirements for:

4. The Low Case in all areas (including the Monterey),
5. The Sisquoc Sands in all areas, and
6. The Monterey Formation in all areas.

For the purpose of the aquifer exemption analysis, EPA does not concern itself with the status of water relative to agricultural use; however, California agencies are using the potential for higher and better uses for reinjected water as a tool in assessing their suggestions to EPA. Due to the high boron concentration and the depth of the wells in the subject Sisquoc Sands and Monterey Formation, the agricultural use costs were determined to be:

Table 2.0-3: Economic Feasibility Summary-to Treat Formation Water for Agricultural Use

	Per Household Rate Burden (Annualized \$/HH)					
	Wells	Facilities	Piping	Operational	Total	Agricultural Water
Economic Base						\$40/ac-ft (\$130.32/Mgal)
Low Case 2000 feet (Average Well Depth)						
Cost to serve ag water (\$/Mgal)	\$928.46	\$4,347.73	\$365.27	\$18,065.14	\$23,706.61	181.91
Sisquoc Sands 2000 feet (Average Well Depth)						
Cost to serve ag water (\$/Mgal)	\$928.46	\$5,690.03	\$365.27	\$22,408.47	\$29,392.23	225.54
Monterey Formation 3000 feet (Average Well Depth)						
Cost to serve ag water (\$/Mgal)	\$1,392.69	\$4,371.87	\$365.27	\$20,194.43	\$26,324.26	202.00

Boron remains the largest problem for use as an agricultural source. The cost for a farmer to produce and treat the least costly source East Area water to a suitable level of boron (with no Service or Distribution costs) is substantially greater (150 times costlier) than the current all-in cost of \$40/ac-ft for water deliveries at the farm well head. (Gibbs, 2012).

2.1 Availability of less costly and more readily available alternative supplies-40 CFR 146.4(b)(2)

The nearest entity serving a specific target residential area whose complete service territory is subject to impact is the unincorporated city of Los Alamos (472 connections, in 2011). The community has 4.2 persons living in each household with an average per capita water use of 194 gal/person/day (County, 2013).⁵

Table 2.1-1, Water Required to Meet Projected Demands shows the water deliveries made by the DAU 71 and 73 Water Purveyors in their respective service territory. LACSD will continue to use ground water to follow their forecast 268 acre feet of demand at 35\$/acre feet (this price is similar to the projected cost of water for agricultural purposes). Los Alamos CSD does not show any net water needed by 2025. Ground water will continue to be the primary source of water for M&I and the regional net water needed (based on Private M&I) is 20,664 acre feet. LACSD response concerning possible oilfield sourcing of produced water as an alternative to normal sources indicates that ratepayer willingness to pay for incremental facilities has been tested and similar to EPA's study the outcome threshold was very low, (Bernard, Letter to B. Falkenhagen, 2016).

Water supplies in the San Antonio Valley are mainly derived from groundwater; some importation of State Water Project supplies occurs and is delivered to the service area of Vandenberg Air Force Base within DAU 73. Los Alamos Creek, which drains the valley, is intermittent. Rainfall and flow in the creek are the sources of recharge. No significant impoundments occur on Los Alamos Creek or its tributaries. The Los Alamos Community Services District supplies water from wells to the community of Los Alamos. Water supplied by the LACSD is approximately 1.5 percent of the water currently used in DAU 73. The San Antonio Basin underlies approximately 70,400 acres and comprises alluvium and semi-consolidated sands and gravels (Paso Robles Formation). This basin is utilized by agriculture and the LACSD; Vandenberg AFB has back-up wells in the westernmost portion of the basin, but production from those wells has fallen over 90 percent since importation of SWP supplies. The SBCWA reports the current safe yield estimate as approximately 15,000 AFY1.

⁵ The unincorporated community of Los Alamos is served by the Los Alamos Community Service District which draws water from three dedicated wells inside the service district territory. To allow for the most conservative (lowest per household cost) the incremental cost-to-serve calculations are based on the larger state average households in communities served (1799 households) and assumes that the Sisquoc Sands and Monterey formation in the various Areas of Cat Canyon Oil Field have sufficient water to be treated for the 20 year lifespan used in the economics. This is done to allow for economy-of-scale benefits.

Table 2.1-1 Water Required to Meet Projected Demand, ac-ft																
	2010				2015				2020				2025			
	Total Available	Total Demand	Total Return Flows	Net Water Needed	Total Available	Total Demand	Total Return Flows	Net Water Needed	Total Available	Total Demand'	Total Return Flows	Net Water Needed	Total Available	Total Demand	Total Return Flows	Net Water Needed
DAU 73:																
Los Alamos CSD	-	275	62		-	270	61		-	261	59		-	268	60	
Private San Antonio M&I, Ag		33,168	4,312			33,168	4,312			33,168	4,312			33,168	4,312	
San Antonio Totals	9,000	33,443	4,374	20,069	9,000	33,438	4,373	20,065	9,000	33,429	4,371	20,058	9,000	33,436	4,372	20,064
DAU 71:																
City of Santa Maria	16,354	13,072	9,422		16,243	16,223	11,708		16,132	15,600	11,273		16,022	16,100	11,637	
Golden State Water Co.	2,247	6,594	1,627		2,244	8,295	2,051		2,241	7,634	1,891		2,237	7,879	1,961	
City of Guadalupe ¹	382	930	209		378	1,004	226		375	1,094	246		371	1,194	269	
Private SMV, M&I and Ag ^{1,1}		101,852	18,333			101,852	18,333			101,852	18,333			101,852	18,333	
Casmalia CSD ¹	-	9	-		-	9	-		-	9	-		-	9	-	
Santa Maria Totals	86,983	122,457	29,592	5,882	86,865	127,383	32,318	8,200	86,748	126,189	31,743	7,698	86,630	127,034	32,200	8,204

An extensive wetland at the western end of the basin, the Barka Slough, is formed where less permeable rocks underlying the basin brings groundwater to the surface, (County, 2013). The next available water is through one of the regional suppliers in surrounding DUAs, followed by State Water Project water via one of the SWP contract holders; however, under these conditions, private M&I water producers (who use 98.5% of the water) may be forced to curtail demand in favor of residential users (who use 1.5% of the water in DAU 73).

In the future, private M&I and agricultural water users (460 in 2010), separate of the Los Alamos CSD (which relies on its own wells to supply their residential users), may be able to contract for additional supplies from, the Central Coast Water Authority (CCWA) which operates the Coastal Branch of the SWP to bring treated water to a number of purveyors in the County. Presently, this area is not being served by the SWP. All water delivered to Santa Barbara County passes through the Polonio Pass Treatment Plant, and these potable water supplies may be introduced directly into purveyor's distribution system from which both LACSD and private M&I can be obtained under contract,⁶ (County, 2013).

2.2 Cost of Alternate Water Supply

Base costs for the alternate water supply reference the purchase of State Water Project water by City of Santa Barbara. The city of Santa Barbara typically takes State Water deliveries of approximately 600 to 700 AF pursuant to its obligation under the Exchange Agreement with the Santa Ynez River Water Conservation District, Improvement District No. 1.

The variable costs for State Water are approximately:

- \$160/AF for Exchange Water and
- about \$300/AF for deliveries of water into Lake Cachuma.

Fixed costs are the major portion of total costs and are about \$1,400/AF for urban uses. (Santa Barbara County, 2017)

Recent SWP trends in costs

For the SWP the cost per acre-foot for water deliveries in the first half of FY 2017/18 is estimated to be \$124/AF and \$125/AF for the second half of the fiscal year.

Variable Cost per Acre-Foot Analysis

The Preliminary FY 2017/18 variable cost per acre-foot for Table A water is \$195.82 for the North County project participants and \$282.34 for South Coast project participants, (California Central Coast Water Authority, 2016).

A fully burdened SWP urban delivery surface water contract (based on the city of Santa Barbara which has SWP allocations) is approximately \$1,400/ac-ft as opposed to \$3,464/ac-ft to treat Cat Canyon, East Area formation water. This is a procurement cost, less Service and Delivery, on an acre-foot basis, not to be confused with the all-in incremental cost burden per household.

Therefore, the alternative sources are less costly and are more readily available to meet present and future needs than the Sisquoc Sands and Monterey formation water.

⁶ CCWA contracts with the SBCFCWCD for a SWP allocation of 45,486 Acre Feet per Year (AFY) divided among 14 allocation holders with 41,578 AFY held by individual participants and an additional 3,908 AFY is held by CCWA as a "drought buffer" to help firm up the overall entitlement of SWP participants in Santa Barbara County. (County, 2013)

2.3 Adequacy of alternatives to meet present and future needs-40 CFR 146.4(b) (2)

The groundwater basins in Santa Barbara County (DUAs 71 thru 76) are capable of meeting the community needs for water in and around the county. Normal SWP allocations in Santa Barbara County are 41,588 ac-ft/yr.⁷

“The Region identified issues and challenges of the four major watersheds (Santa Maria, San Antonio, Santa Ynez, and South Coast watershed)... The watershed issues and challenges were then used to develop regional objectives and targets as mentioned above. The issues and challenges are listed below:

1.1.1 Santa Maria River Watershed Issues and Challenges

- Sedimentation accumulation in Twitchell Reservoir which leaves less supply for groundwater recharge, habitat preservation, and fish migration;
- Wildfire risk that could increase sediment accumulation in dams, rivers and streams and therefore increases the risk of flooding;
- The need for continued groundwater monitoring and management to ensure compliance with water quality standards and adequate supply;
- Fluctuations in State Water Project (SWP) deliveries due to annual variations in climate, hydrology, and regulatory constraints, and
- Cuyama Groundwater Basin is in a state of significant overdraft and some water quality impairments are of concern.

1.1.2 San Antonio Creek Watershed Issues and Challenges

- Groundwater basin overdraft and with a resulting increase in pumping lift costs;
- Lack of affordable supply in Casmalia;
- Insufficient integration of adjacent systems constrains operational flexibility, and
- Changes in clean water standards may require modification of stormwater and water quality management....”[ed.], (County, 2013)

Further, “The chronic overdraft of the local groundwater basins presented a serious environmental threat. Since many of these groundwater basins are adjacent to the ocean, the risk of saltwater intrusion and permanent damage to groundwater basins weighed on the minds of local water officials. In addition, reports from other areas in California (including some from San Luis Obispo County) indicated that groundwater overdrafting was causing surface soil subsidence. Local water agencies understood the significant environmental benefits that could be derived by reducing groundwater "mining" by diversifying water supplies to include imported water” (CCWA, 2015).

Agricultural Demand and M&I water users may be faced with needs to alter farming methods and crops to reduce their consumption. The SWP surface water contracts are for deliveries of Delta water with an average [Boron] = 0.21 mg/L and [TDS] = 130.6 mg/L; these contracts are less costly and are more readily available to meet present and future needs as opposed to the proposed Gato Ridge Area Treated Water from the Basal Sisquoc or the Monterey Formation

⁷ Drought Buffer is 3,908 ac-ft/yr.

having an average [Boron] = 0.97 mg/L and [TDS] = 346 mg/L, (Department of Water Resources, 2017).⁸

Some surface water is available but is seasonal; cloud seeding is performed as an effort to improve rainfall. According to the Regional Water Management Plan-

“Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. According to State Board Resolution No. 88- 63, "Sources of Drinking Water Policy" all surface waters are considered suitable, or potentially suitable, for municipal or domestic water supply except where:

- a. TDS exceeds 3000 mg/l (5000 uS/cm electrical conductivity);*
- b. Contamination exists, that cannot reasonably be treated for domestic use; and*
- c. The source is not sufficient to supply an average sustained yield of 200 gallons per day...”* (Central Coast Regional Water Quality Control Board, 2011).

3 Economic Analysis-40 CFR 146.4(b)(2)

Table 2.0-2, shows the summary results of the feasibility analysis for the Sisquoc and Monterey formations in the Cat Canyon Oil Field. The center of the Cat Canyon Oil Field is approximately 3 miles from the nearest accessible service connection, and the hypothetical treatment facility for the study is considered to be 2 miles by right-of-way from the nearest accessible service connection, **Figure 1.2-2, Proposed Pipeline Route**. The feasibility analysis assumed that the water produced from the Sisquoc and Monterey formations is from the approximate mean formation depth of 3000 feet.

Oil shows are present in various samples taken from the subject formation in the study area. This limits the usefulness even if the oil and naturally occurring hydrocarbon related water soluble constituents are removed as part of the drinking water or irrigation water production process.⁹ The area wide average household water use is estimated to be 444 gallons per day using EPA’s national average based estimated per capita consumption of 150 gpcd and Census reported 2.86 persons per household in Santa Barbara County.¹⁰ The design assumption for EPA consideration is that the water must be treated to Drinking Water Standards for use by the unincorporated community of Los Alamos, the nearest urban population situated near the study area. The water taken from the subject formation could more likely serve as agricultural water and the boron

⁸ DWR Devils Den Station Water supplies the Central Coast Water Authority. Samples were used from 1968 to present.

⁹ In order to produce oil from the formations steam is injected in sufficient quantities to mobilize the entrapped heavy oil. The water injected as steam adds water to the formation replacing the connate water as it is extracted during normal commercial oil production. If steam is not applied the oil will come out more slowly but will still present a challenge for treatment methods that are “reasonably employed in public water treatment systems”. However, the oil can be collected and sold commercially to offset any costs for cleaning. Such operational benefit is not considered in the scope of this analysis as the presence of commercial quantities of oil would most likely constitute a basis for declaring the formation exempt from USDW status. This feasibility study presumes that oil is brought to the surface in the process of pumping water from the formation is not subject to split estate issues (no sales equipment, custody transfer of shipping provisions). Oil separation equipment is only added to protect the process equipment as well as ensure public health and safety.

¹⁰ Los Alamos actually reports an average household size of 3.01 (this value was used); the SBC IRWMP reports a higher household size, which would return a less protective higher cost per household.

would have to be lowered from the current post-proposed-planning-level-facility treatment level of 0.92 mg/L to a level suitable for a specific crop in question. **Table 3.0-1** addresses the EPA criteria. The Golden State Water Company Households costs for the Santa Maria District are also included to address the 183 persons living in Sisquoc CDP.

Table 3.0-1: Summary: Economic Feasibility												
	Per Household Rate Burden (Annualized \$/HH)					Income Burden		Increment Sensitivity				Subsidy
	Wells	Facilities	Piping	Operational	Total	Santa Barbara County	Los Alamos CSD	Threshold Increase	Current Water Source Rate (LACSD)	Current Water Source Rate (GSWC)	Agricultural Water	AB2334 High Cost Subsidy Eligibility
Economic Base						\$89,903	\$83,499	\$450	\$460	\$617	\$40/ac-ft (\$130.32/Mgal)	\$83,499
Sisquoc Formation: 2000 feet (Average Well Depth)												
1799 Household Case	\$311	\$1,906	\$122	\$6,529	\$8,868	9.9%	10.6%	19.71	20.28	15.37	na	9.9%
Cost to serve ag water (\$/Mgal)	\$928	\$5,690	\$365	\$22,408	\$29,392	na	na	na	na	na	226	na
Monterey Formation: 3000 feet (Average Well Depth)												
1799 Household Case	\$466	\$1,464	\$122	\$5,326	\$7,380	8.2%	8.8%	16.40	17.04	12.96	na	8.2%
Cost to serve ag water (\$/Mgal)	\$1,393	\$4,372	\$365	\$20,194	\$26,324	na	na	na	na	na	202	na
Low TDS Case 2000 feet (Average Well Depth)												
1799 Household Case	\$311	\$1,456	\$122	\$5,074	\$6,964	7.7%	8.3%	15.48	16.14	12.29	na	7.7%
Cost to serve ag water (\$/Mgal)	\$928	\$4,348	\$365	\$18,065	\$23,707	na	na	na	na	na	182	na

The summary table breaks out the levelized capital by wells, facilities and pipelines. Operational costs are presented as a “roll-up” of pumping and maintenance costs. Although EPA includes Delivery and Service in their all-in cost for analysis these costs require costs studies from the service providers which are not always made available. This screening level analysis conservatively tests against the more readily available engineering costs and assumes if these costs are too high then the all-in costs with Delivery and Service will also be too high. No administrative costs assigned to the LACSD are included, these are Delivery and Service costs typically 60% to 68% of the all-in cost for a metered delivery to a residence on a national basis, (US EPA, 1986, p. Appendix G). None of the costs associated with the acquisition of water rights are included as there is no historic basis for the value. The water rights in the Cat Canyon Oil Field are held primarily by oil companies (that also own the surface) and private interests that own the surface and thus water rights; water purveyors would have to secure the water rights at “all-in costs” which today are speculative.

3.1 California Average Household Case (1,799 households)

Given that Los Alamos CSD reports 553 residential units, the California Average Household Case (1,799 households) captures a greater economy-of-scale and the benefit is spread out over more households.

This facility was sized using the USEPA, “Estimating Water Treatment Costs. (EPA, 1978)

4 Review of Available Technologies -40 CFR 146.4(b)(2)

4.1 Design Basis for Technology Review

Table 1.2-2 shows the formation water is over 3,000 mg/L. Water used for distribution in a public water facility must meet criteria on an MCL basis.¹¹ The boron is unacceptably high; therefore, any treatment approach must achieve the removal of boron to below notification levels, below safe levels for either human consumption (1.0 mg/L) or agricultural application (0.7mg/L).¹²

5 Management and Treatment Options

Reuse of oil field produced water is the first and cheapest alternative with the cost being largely imbedded in tankage and pumping (all-in levelized costs = \$416/million gallons). Water/oil separation is considered a normal cost associated with produced water and while it is an operational cost for oil field activity it remains a necessary treatment cost for Public Treatment Works that must deal with the hydrocarbons in the connate water common to formations historically producing hydrocarbons (all-in levelized costs = \$80/million gallons). In instances where the produced reuse involves enhanced oil recovery or disposed as injectate the water may be treated for corrosion control and to prevent well and formation plugging.

Land application to crops of the subject water can be considered a form of treatment, but only provided the otherwise reinjected water has less than 0.7 mg/L of boron and is applied at agronomic rates. (California State Water Board, 2017)

¹¹ California Code Title 22

¹² The first threshold specified in the Water Quality Goals Database for boron (CAS 7440-42-8) is 1,000 µg/L (1mg/L) based on Toxicity objective to protect human health and applies to groundwater and inland surface water. USEPA health advisory level is 5 mg/L. USEPA IRIS RfD is 1,400 µg/L (1.4 mg/L).

5.1 Water Treatment Technology Components as Options

5.1.1 Water Wells

The hypothetical water wells proposed in this planning level study for production from the proposed formations are expected to be drilled as far down-dip in the subject formations as possible in the proposed exemption area. This greatest possible separation from the oil-water cut line will minimize the amount of oil and gas coming up with the water. Mean Well Depths would range around from 2000 to 3000 feet bgs depending on which aquifer element is being developed for potable water, (Sisquoc is set at 2000 feet and Monterey is set at 3000 feet).

These wells will be drilled, by necessity, in a manner that reflects the potential presence of oil and gas associated with the subject formations. Well control must be established and maintained to prevent risk to the operators or the environment. Well yield is based on a controlled yield capability of 250 GPM per well and are designed for water pumping and not for oil recovery.¹³ Expected water yields based on oil production and produced water injection data are actually 31 GPM, (Falkenhagen, 2017). However, actual field based yield from wells perforated for oil production are substantially lower than single purposed water wells with wide ranges of slotted and gravel pack completions for water capture. (DOGGR, 2010)

No new electrical infrastructure cost was included in the cost of the well's investment "Capital" as the existing infrastructure up to any potential service drop may be valued in the current electrical service tariff and thus is assumed to be imbedded in the cost of the electricity. No well rework or maintenance to manage potential sanding problems was included in the well operations and maintenance.

5.1.2 Oil Removal Equipment

Connate water (produced from an oil bearing zone) facilities require separation of the residual oil and gas from the water. This is done using a separator vessel that operates at line pressure to allow the gas to be carried to a flare (lowest cost assuming permits and Emission Reduction Credits are available). It is assumed that the gas would be "stranded" and flared. The oil can be stored and either disposed of as waste or sold to marginal oil production collectors. In this planning level design the separation equipment is assumed to be needed for 10% of the water produced. If the water requires more treatment the equipment costs could be ten-times higher for any design case.

If necessary, the separated water may be further stripped of oil and other volatile components using an aeration flotation device commonly called a WEMCO after one of the larger manufacturers. Once the water has been stripped of the free oil, the water may need to be passed over additional filtration media such as nut shells or sand.

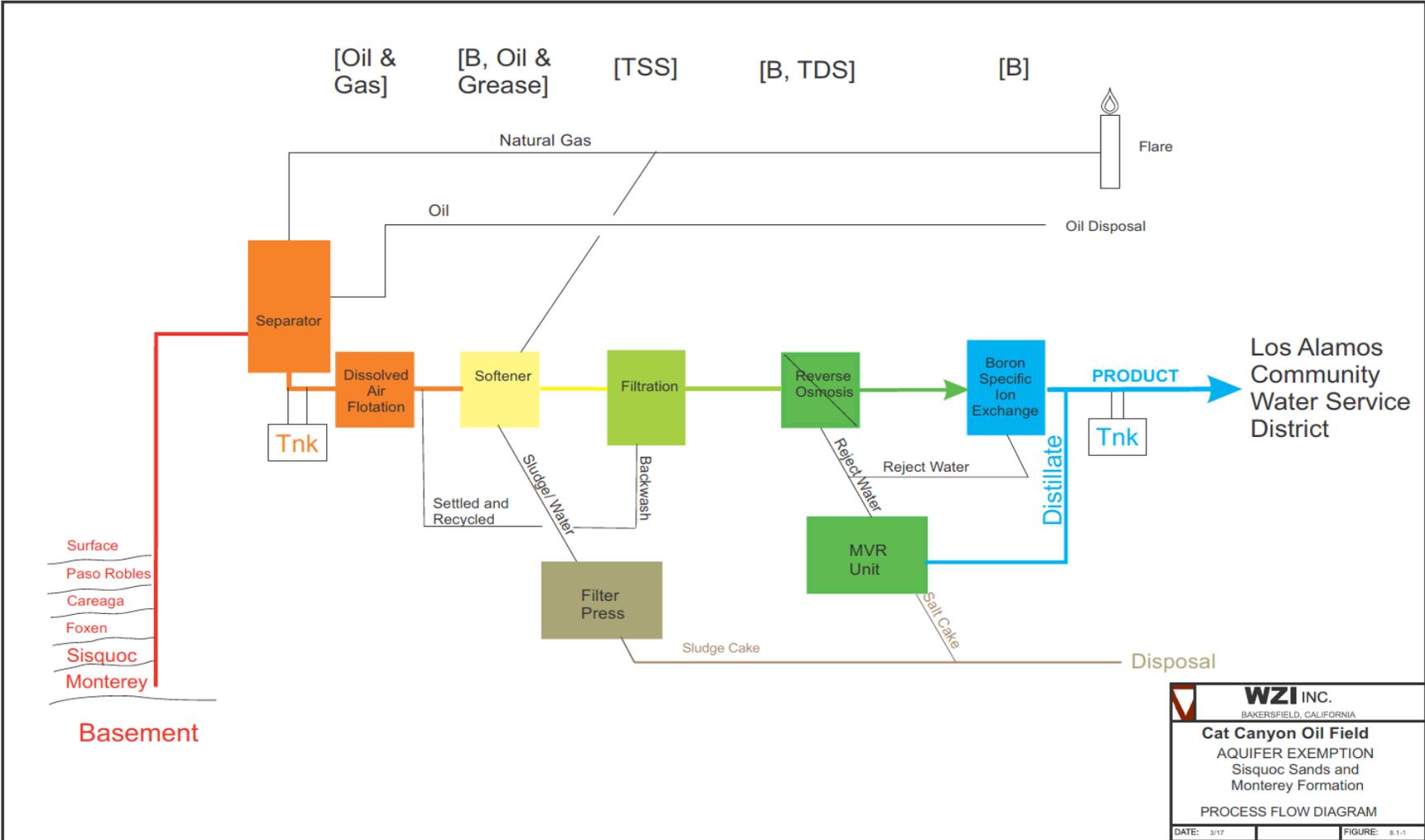
5.1.3 Water Treatment Equipment

Figure 5.1-1, Process Flow Diagram: Sisquoc Sands and Monterey Formation and Figure 5.1-2, Process Flow Diagram: East Area shows the selected design for the treatment to achieve

¹³ The best producing well in Gato Ridge produced 1081 barrels per day (31 GPM). The field produced water production is roughly 4,362 barrels of water per day (127 GPM). However, oil production considerations are not a factor in this planning level design. Completion and well design is predicated on the design assumption that the wells will be drilled, completed and operated for water service only and that deliveries will be sufficient to serve the state average households served by a public purveyor. Any oil recovered in the process is treated as a potential drinking water contaminant and is removed and disposed of in a manner reflective of public health criteria.

Drinking Water Standards. The treatment includes provisions to remove Oil/Grease and Natural Gas, Hardness and Total Suspended Solids as well as the Total Dissolved Solids and Boron. As a secondary benefit the Radon is removed by the mechanical disturbance in the softening system. Waste management is achieved through filter press for the solids (softener sludge) and injection wells for solutions. Reverse Osmosis rejected water is assumed to be injected into formations suitable for injection via Class I (must be injected into isolated formation below deepest USDW within ¼ mile isolation) or Class V (non-hazardous fluids into or above USDW) wells permitted through EPA.¹⁴

¹⁴ California may restrict this limit to 3,000 ppm TDS.



WZI INC. BAKERSFIELD, CALIFORNIA	
Cat Canyon Oil Field AQUIFER EXEMPTION Sisquoc Sands and Monterey Formation	
PROCESS FLOW DIAGRAM	
DATE: 3/17	FIGURE: 8.1-1

Figure 5.1-1

5.1.4 Lime Softening, Separation and R.O. Pretreatment

The primary cause of hardness is the presence of multivalent ions, such as calcium (Ca^{2+}) and magnesium (Mg^{2+}). These ions or minerals often directly associated with high TDS waters can cause scaling of pipes and equipment in drinking water and process water systems. In a Lime Softener, precipitation is achieved by raising the pH of water and provoking the precipitation of calcium carbonate (CaCO_3) and magnesium hydroxide $\text{Mg}(\text{OH})_2$. Precipitates are removed by means of conventional processes such as coagulation-flocculation, sedimentation, and filtration. After precipitation, the water is recarbonated to lower the pH in order to reduce scale formation, typically near pH 8.4. In addition to the removal of hardness, precipitative softening can be used for the removal of arsenic, radionuclides, dissolved organics (including disinfection byproduct precursors), color, and microbial contaminants, (Degremont, 1979) (Metcalf and Eddy, 1991). Further, the agitation cycle of the softener coupled with the separation process is expected to adequately aerate the water to allow the release of the Radon. If additional Aeration or Carbon Filtration is required to eliminate the Radon or to meet a future standard, then the costs for the equipment as well as associated operations and maintenance would have to be included.

The most important parameter controlling the removal of precipitative softening is pH. For calcium carbonate precipitation the pH is raised to approximately 10 and for magnesium hydroxide precipitation the pH is raised above 11. The removal of other substances is also dependent of pH. Arsenic removal is greatly increased at pH greater than 10.5. As pH increases, more total organic carbon (TOC) and color are removed. Removal of radionuclides also improves as pH increases. (EPA, 1998)

Lime softening is typically used for water containing low concentrations of non-carbonate hardness.¹⁵ In this particular design the boron is also targeted through the use of lime softening. Softening may be two stage wherein excess lime is added to the first stage to pH 11 for magnesium control, followed by recarbonation to near pH 10 in the second stage for calcium control where soda ash may or may not be added, followed by final recarbonation. Softening may be split wherein one stream is softened and another is conventionally treated. These waters are then blended to achieve target final hardness.

The lime impregnated water is passed through a separator (sometimes a Corrugated Plate Separator) for clarification and then filtered. This process is expected to clarify any free and emulsified oil and grease and trap it in the sludge prior to settling. Two parameters frequently used to describe the clarification process are the overflow rate and the detention time. The overflow rate is the process loading rate and is usually expressed in gpm/sf or gpd/sf. Overflow rates for conventional sedimentation generally range from 0.3 to 1 gpm/sf (500 to 1500 gpd/sf). Overflow rates for other processes can vary significantly. There are proprietary sand-ballasted clarification systems that have been demonstrated to operate effectively at overflow rates as high as 20 gpm/sf; typical detention times range from 1 to 2 hours.

Overall, the amount of sludge produced depends on the water's hardness. Depending on the hardness of water, the average water treatment plant produces 1,000 to 8,000 pounds of solids

¹⁵ In this particular design the boron is also targeted through the use of relatively lower cost lime softening.

per million gallons of water treated. The estimated sludge volume is 2,666 pounds per million gallons based on EPA estimates.

Lime sludge is frequently recycled to the clarification process to improve precipitation, reduce chemical usage, and improve process performance. Sludge generated by softening can also be disposed by discharge to a sanitary sewer, drying lagoons, and land application. If the sludge contains high concentrations of metals or toxic substances it may be required to be disposed in a hazardous waste landfill.

Filter Presses will be used to dewater the sludge prior to disposal. Drying lagoons (followed by hauling the dried solid waste) are an alternative, but since the area is so rugous, lagoons are not considered part of this design.

5.1.5 Post Lime Softener/Clarifier Filtration

The most commonly used filter type in softening process is a dual-media filter comprised of anthracite and sand; however, mono-media (sand), multi-media (garnet, anthracite, and sand), and other media configurations - including the use of granular activated carbon - are also used in drinking water treatment. During filtration, the majority of suspended particles are removed in the top portion of the filter media. Filters are backwashed to dislodge and remove particles trapped within the filter bed, to reduce head loss, and to keep the filter media clean.

The filter loading rate is a measure of the filter production per unit area and is typically expressed in gpm/sf. Typical filter loading rates range from 2 to 4 gpm/sf; however, higher filter loading rates, 4 to 6 gpm/sf, are becoming more common at full-scale. This can be a critical parameter because it determines the water velocity through the filter bed and can impact the depth to which particles pass through the media. The filter run time describes the length of time between filter backwashes during which a filter is in production mode. As the filter run time increases and the concentration of solids in the media increases, the filtration process often performs better with regard to particulate contaminant removal until such time as “breakthrough” occurs or the pressure drop increases requiring an unacceptably high pumping pressure on the inlet side of the filters. (EPA, 1998) The crude oil ($11^{\circ}>API\ gravity < 14^{\circ}$) is assumed to have a high enough TPH and associated BTEX component that activated carbon media is required in the filter prior to reverse osmosis. A degassing process will follow to remove any carbonate artifacts from the shift of the pH in the bicarbonate laden water during softening prior to being fed to the Reverse Osmosis Unit.

5.1.6 Filtration

The selected process for this planning level analysis is a dual-media filter comprised of anthracite and sand; however, mono-media (sand), multi-media (garnet, anthracite, and sand), and other media configurations - including the use of granular activated carbon - are also used in drinking water treatment. During filtration, the majority of suspended particles are removed in the top portion of the filter media. Filters are backwashed to dislodge and remove particles trapped within the filter bed to reduce head loss and to keep the filter media clean.

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5.1.7 Reverse Osmosis

Osmosis is the natural flow of a solvent, such as water, through a semi-permeable membrane (which acts as a barrier to dissolved contaminants) from a less concentrated solution to a more concentrated solution. RO systems frequently require some type of pretreatment to: (1) condition the water for optimum membrane effectiveness, and (2) modify the feed water to prevent membrane fouling and plugging, and (3) maximize the time between cleanings and prolong membrane life. The type of pretreatment required depends on the feed water quality and membrane type. The feed water must be generally free of suspended matter. Acid and/or antiscalant addition is commonly used when scaling is the primary fouling concern.

Scaling occurs when the concentrations of dissolved contaminants in the concentrate exceed the solubility product of a particular compound. Calcium carbonate, calcium sulfate, barium sulfate, and/or silica are typically the limiting compounds. However, hydrogen sulfide, iron, manganese, organics, and microbial levels must also be carefully controlled minimize fouling. A lime scale softening system is provided to reduce the scaling potential.

The concentration of these contaminants in the concentrate stream limits system recovery, which is the ratio of the system permeate and feed water flow rates expressed as a percentage. The concentration of dissolved contaminants in the concentrate stream can increase significantly compared to the feed concentration (up to tenfold) depending on the system recovery, standard RO individual membrane elements have recoveries ranging between 80-85%. Overall system recovery (including cleaning) is estimated to be 80% using a single stage RO configuration to reduce TDS from 2,200 to less than 1000 mg/l and minimize operations and maintenance (pumping) and capital costs.

Temperature can significantly impact membrane performance. Water temperature has a significant impact on water density and viscosity, which impacts RO membrane flux - the rate of product flow through the membrane, typically expressed in gallons per day per square foot of membrane area (gfd). Higher temperatures can cause membrane degradation and compaction of RO membranes. A cooling system is included to reduce the RO inlet temperature. Post cooling pressure filtration and pH adjustment is provided to prolong the RO life.

Residuals generated from membrane separation systems include the concentrate from the membrane processes and the spent cleaning chemicals. Concentrate disposal can be challenging as it is typically a relatively high volume, high TDS waste stream and requires discharge to a wastewater disposal facility. Chemical cleaning is required to periodically remove scale build-up and biological fouling on the membrane surface. Spent cleaning solutions are generally acidic in nature and require neutralization prior to disposal. A Mechanical Vapor Recompression System is included to remove some of the waste water from the various RO waste streams prior to disposal and to increase the yield from the treatment plant.

5.1.8 Boron Ion Exchange

Boron is mildly toxic to humans but frequently very toxic to plants, especially to citrus varieties, and is regulated in most regions of the world. Boron takes the form of boric acid, a very weak acid (similar to silicic acid). Boron specific resins are chelating resins. The leakage rate for well-designed systems is nearly zero after complete rinse to breakthrough. Thus the most cost-effective use of a Boron-Specific Unit would be as a smaller side-flow unit to then blend down the Boron concentration in the main stream.

The resins are typically weakly basic and regenerate in a two-step, co-flow manner. First, the borate is displaced with hydrochloric (HCl) or sulphuric acid (H₂SO₄), and then the resin is converted back to the free base form with sodium hydroxide (NaOH). Regenerant levels are approximately stoichiometric: roughly 1 equivalent of acid per liter of resin, or about 130% of total capacity, and 0.7 equivalent of sodium hydroxide.

The design used in this Planning level design feasibility assumed that Softening and Reverse Osmosis would be sufficient to achieve the Drinking Water Criteria and therefore no additional Ion Exchange Unit for Boron was included.

EPA has issued a Health Advisory for boron. Based on the published Health Advisory, boron needs to be treated to less than 1 mg/l, which is the notification requirement level in California (Regional Water Quality Control Board) (USEPA, 2008). Additionally, boron presents a problem for Domestic horticultural activities and agriculture. Acceptable levels for boron are lower for agriculture than they are for Drinking Water, ranging between 0.7 to 0.750 mg/l. (Regional Water Quality Control Board)

“Only three technologies successfully reduced boron levels to below 0.3 mg/L. These were a boron-specific ion exchange resin, a process of coagulation, precipitation and filtration, and a strong-base anion-exchange resin. Wong dismissed the coagulation, filtration, and filtration process as unacceptable due to high chemical dosage requirements and high operating cost. Of the two ion exchange methods, Wong determined that the strong-base anion exchange resin would have lower regeneration costs, at least in the case of the evaporator product water, which is low in dissolved solids. Reverse osmosis (RO) is similar to other membrane processes, such as ultrafiltration and nanofiltration, in that water passes through a semi-permeable membrane. However, in the case of RO, the membrane is non-porous. RO involves the use of applied hydraulic pressure to oppose the osmotic pressure across the membrane, forcing the water from the concentrated-solution side to the dilute-solution side. The water dissolves into the membrane, diffuses across, then dissolves out into the permeate [product stream]. Most inorganic and many organic contaminants are rejected by the membrane and will be retained in the concentrate [reject stream]. Folster et al. (1980) tested hollow-fiber (HF) RO and spiral-wound (SW) RO in two separate treatment plants in New Mexico. At the treatment plant in San Jon, with influent boron levels of 0.75 mg/L, HF RO and SW RO removed 15 percent and 3 percent of boron, respectively. At Alamogordo, however, where influent concentrations were lower (0.09 mg/L), HF RO and SW RO were ineffective; in fact, boron concentrations rose to 0.14 mg/L and 0.13 mg/L, respectively. These findings suggest that the potential for RO use in boron treatment is limited.”[ed.] (USEPA, 2008)

Substantial reductions in boron may be achieved (at higher operational costs) at a high pH using Lime Softening followed by Reverse Osmosis; however, the produced water must be treated to avoid premature failure of R.O. membranes, the R.O. inlet water must be filtered and pH closely

managed, (Funston, 2002).¹⁶ However, a boron-specific Ion Exchanger needs to be used except to meet the Agricultural criteria, then the pH can be lowered throughout the system improving Softener performance, as well as extending RO maintenance cycles and membrane longevity, however the agricultural costs would exceed the cost of dilution with low boron containing water available to farmers.

5.1.9 Mechanical Vapor Recompression

Mechanical vapor recompression is a highly efficient distillation process wherein a mechanically-driven blower or compressor is used to increase the pressure of the vapor that is produced from the boiler in order to improve heat transfer efficiencies. An increase in the water vapor pressure increases the condensation temperature of the steam rendering it useable for heating the original mixture (in the boiler) in a heat transfer device or heat exchanger. This results in the operation of a distillation process at a substantially lower energy demand.

The feed process solution is often preheated with hot process condensates and/or can be by concentrated solution leaving the evaporator. The present cost of thermal energy makes MVR attractive for the evaporation of any solution whose boiling point rise is moderate.

The major advantage of mechanical recompression over conventional distillation is the ability to recycle the latent heat of flashed vapors to the bottom fluids, saving 10-15 % of the total energy of distillation. Full production energy requirements are about 157 kWh/1000 gallons (6.6 kWh/bbl).

The MVR feed is comprised of Softener regenerant water, Reverse Osmosis reject water and Boron-specific Ion exchanger regenerant water. The distillate from the MVR is mixed with the boron-specific ion exchange product water and becomes part of the treatment facility product stream. The MVR concentrate is passed through a filter to remove excess water combined with other high solids waste stored then hauled to the nearest disposal site. (Barnett, 2015)

This analysis assumes that EPA or RWQCB would not preclude injection into the formations within the study area that is currently having Total Dissolved Solids concentrations of more than 10,000mg/l, therefore the MVR is not costed in. However, if it is required due to conversions of all injection formations to USDW, the costs would increase the installed facility costs by 30% and annual operating costs would effectively double.

5.1.10 Offsite Wastewater Injection Wells

Waste water from the ion exchange regeneration and reverse osmosis rejection can be injected into Class I or Class V wells. The volume requiring injection is approximately one-third of the water produced and treated, the other two-thirds is the facility product which goes to the service drops (households, commercial and industrial). This would be the cheapest means of disposal allowing the water head to drive the injection (\$0.04/bbl injected) assuming the appropriate receiving formation is not too tight. However, because the hypothetical water purveyor is not eligible for the readily available Class II injection, the waste water would have to be piped to an injection field that has a qualified formation with greater than 10,000mg/L TDS and does not

¹⁶ The study results were used in other exemption studies and it considered various options to treat produced water for industrial agricultural and drinking water uses. The water was received after treatment, free of oil. The study assumed ready access to Class 1 or Class V wells for injection of RO reject and other waste water.

overlay a USDW. The water service purveyor would have to permit all injection wells as Class I or Class V at flows that would limit the injection pressures below the fracture gradient.

5.2 Waste Water Disposal Technologies and Options

5.2.1 Surface Water Disposal

These types of discharges are conducted under an NPDES permit. Some NPDES permits contain effluent limits for EC and/or TDS, and others have narrative requirements for pollutant minimization, depending on the concentration of salts in the effluent and the assimilative capacity of the receiving water.

This alternative is not considered since the waste water is of a quality that would potentially contaminate ground water sources via percolation.

5.2.2 Land Disposal

The discharge of waste water to land is regulated through WDRs, Waivers of WDRs, or General Orders. There are several types of land discharge methods, including disposal to unlined disposal ponds, lagoons, spreading basins, land disposal on fallow or uncropped land, irrigation of crops at agronomic rates, and disposal to lined ponds in accordance with Title 27. In the past, disposal of wastewater using unlined ponds, lagoons, spreading basins, or uncropped land has been a common practice. However, there is increasing concern regarding the potential for these practices to result in groundwater degradation, and, as a result, additional management practices are augmenting these disposal methods, or alternative practices are replacing them.

This alternative is not considered since the waste water is of a quality that conflicts with land disposal.

5.2.3 Evaporation Ponds

Evaporation Ponds are not considered feasible as the salt loading must be managed and the local Santa Barbara County region evapotranspiration rate is insufficient to facilitate volume reduction year round.¹⁷ As such the Public Treatment Works would have to install adequate pond storage for the entire winter outfall as well as adequate capacity to allow the evaporated salts to be removed without impeding the treatment process. Salt accumulation at near-surface conditions will continue to be a concern for the State, Regional Water Quality Control Board and regional farmers.

¹⁷ California Irrigation Management Information System (CIMIS), July, 2016

This alternative is not considered since the water is of a quality that does not require treatment with technologies resulting in a waste stream requiring disposal.

5.2.4 Hauling/Off-Site Disposal

Hauling and off-site disposal of saline wastewater is a practice conducted on a relatively limited basis. Trucking costs and traffic volume to transport Public Treatment Works volumes of waste water are a limiting factor and volume reduction is essential to minimizing the cost and externalities associated with trucking large volumes of waste water. Volume reduction may be achieved through mechanical vapor recompression evaporation (if recovery of distillate has greater intrinsic value than the first cost and high operating costs) or evaporation ponds (if space is not a consideration and climate and terrain allows).

This alternative is not considered since the water is of a quality that does not require substantive treatment with technologies resulting in a waste stream requiring disposal.

Reference Evapotranspiration (ET _o) Table ¹⁸													
SANTA BARBARA	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual ET _o
Betteravia	2.1	2.6	4.0	5.2	6.0	5.9	5.8	5.4	4.1	3.3	2.7	2.1	49.1
Carpenteria	2.0	2.4	3.2	3.9	4.8	5.2	5.5	5.7	4.5	3.4	2.4	2.0	44.9
Cuyama	2.1	2.4	3.8	5.4	6.9	7.9	8.5	7.7	5.9	4.5	2.6	2.0	59.7
Goleta	2.1	2.5	3.9	5.1	5.7	5.7	5.4	5.4	4.2	3.2	2.8	2.2	48.1
Goleta Foothills	2.3	2.6	3.7	5.4	5.3	5.6	5.5	5.7	4.5	3.9	2.8	2.3	49.6
Guadalupe	1.5	2.0	3.5	4.7	5.3	5.3	5.1	4.8	3.7	3.3	2.0	1.7	42.8
Lompoc	2.0	2.2	3.2	3.7	4.8	4.6	4.9	4.8	3.9	3.2	2.4	1.7	41.1
Los Alamos	1.8	2.0	3.2	4.1	4.9	5.3	5.7	5.5	4.4	3.7	2.4	1.6	44.6
Santa Barbara	1.7	2.2	3.4	5.0	5.0	5.2	5.3	5.3	3.9	3.5	2.2	1.8	44.6
Santa Maria	1.8	2.3	3.7	5.1	5.7	5.8	5.6	5.3	4.2	3.5	2.4	1.9	47.4
Santa Ynez	1.7	2.2	3.5	5.0	5.8	6.2	6.4	6.0	4.5	3.6	2.2	1.7	48.7
Sisquoc	2.1	2.5	3.8	4.1	6.1	6.3	6.4	5.8	4.7	3.4	2.3	1.8	49.2
Solvang	2.0	2.0	3.3	4.3	5.0	5.6	6.1	5.6	4.4	3.7	2.2	1.6	45.6

5.2.5 Out-of-Valley Conveyance

The strategy to control of salt by conveyance a location outside of the San Antonio Valley could mitigate exposure to surface and near surface salt accumulations. Planning and implementing for a project that would collect waste from sources and would require state and federal infrastructure funding is not considered a suitable element in the applicable technologies for treating the subject water.

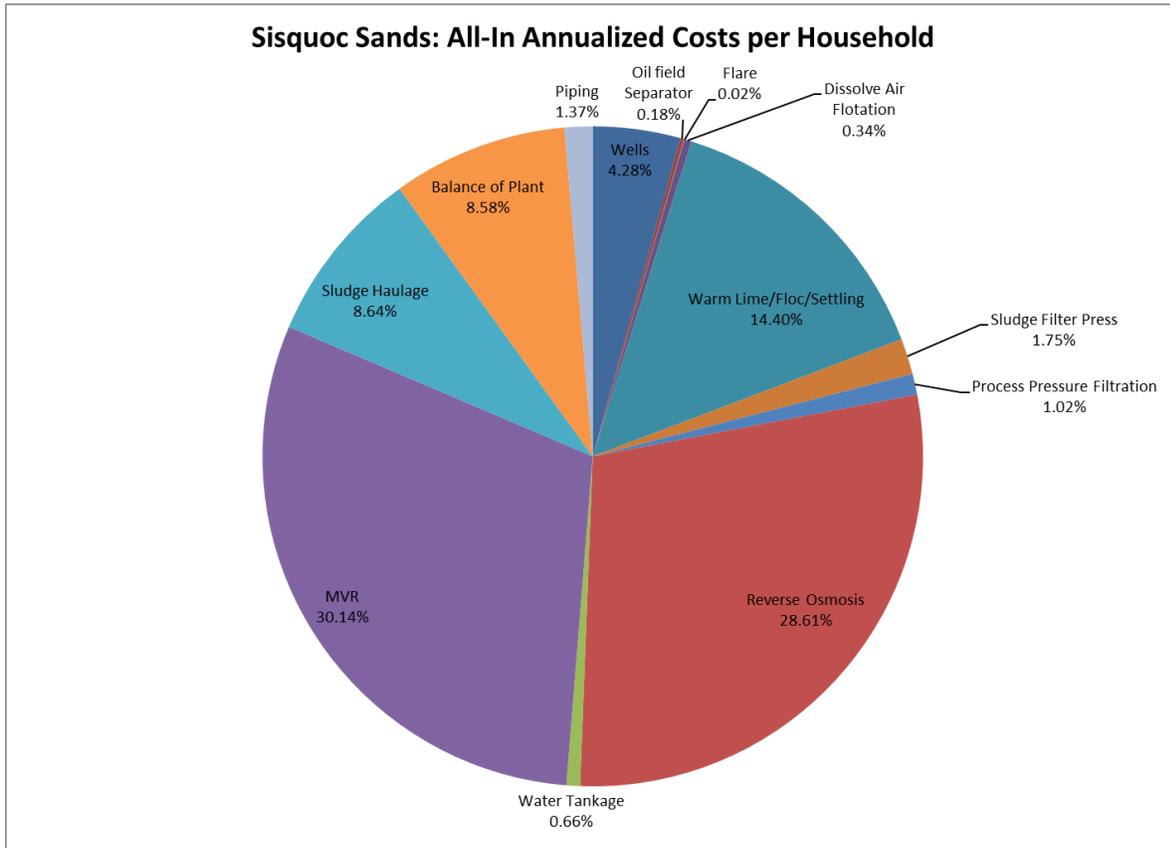
6 Sensitivity

The pie charts below shows the relative costs of each water treatment component used to treat the area wide formation water (if it were produced at a TDS of 7064 mg/L well below any

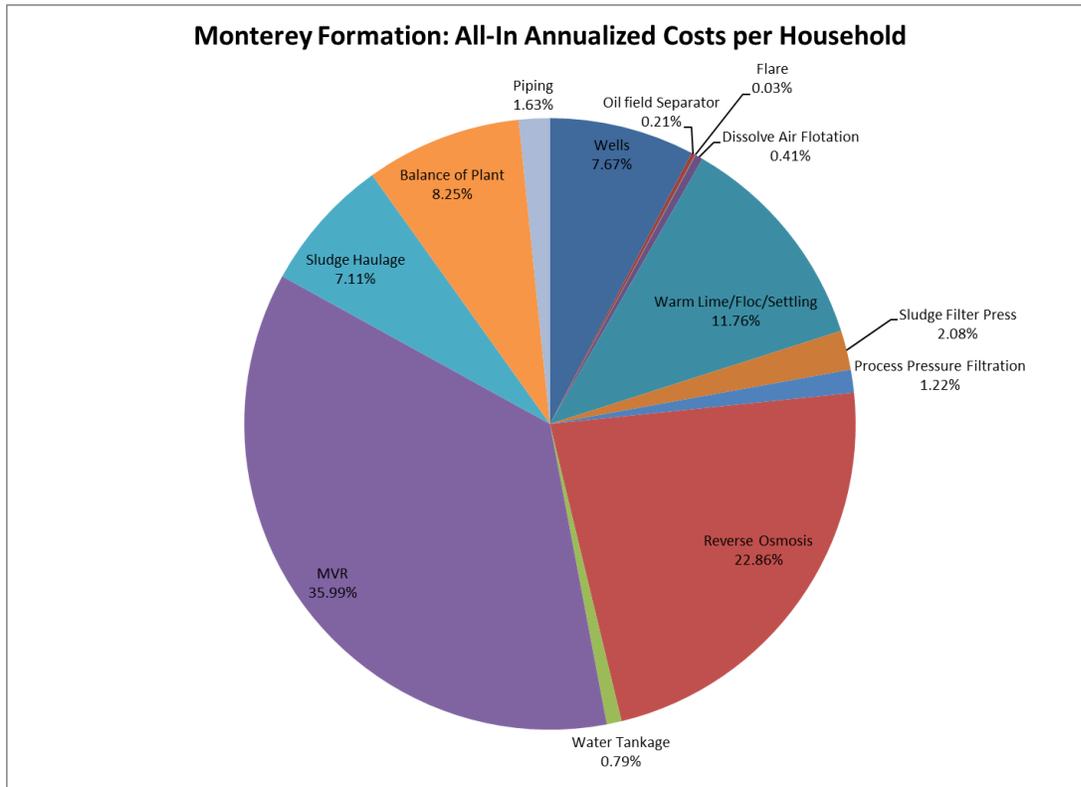
¹⁸ California Irrigation Management Information System (CIMIS)

reasonably expected formation water average) to conform with California Drinking Water Requirements. The largest driver in the sensitivity is the presence of boron in high concentrations which affects the sizing of the softener equipment, Reverse Osmosis equipment and the Mechanical Vapor Recompression system.

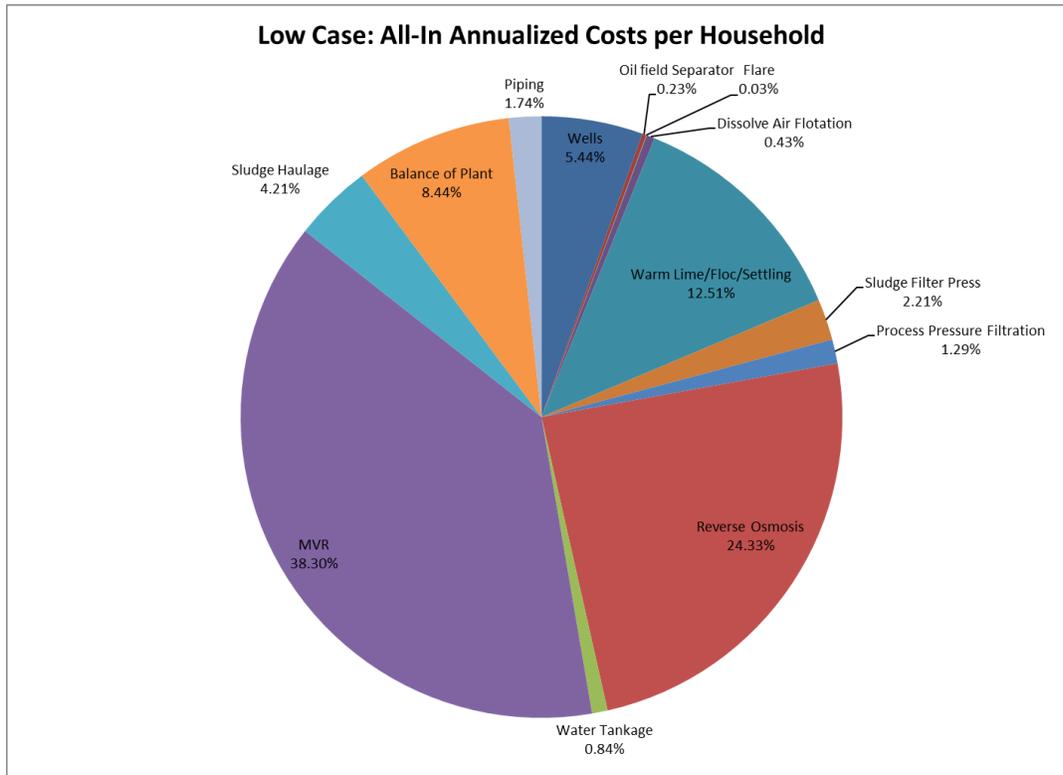
The pie chart below shows the relative costs of each water treatment component used to treat the Sisquoc Formation water to conform to California Drinking Water Requirements.



The pie chart below shows the relative costs of each water treatment component used to treat the Monterey Formation water to conform to California Drinking Water Requirements.



The pie chart below shows the relative costs of each water treatment component used to treat the Low TDS case (East Area) water to conform to California Drinking Water Requirements.



In general, the sensitivity of capital costs is in:

1. Inclusion of Mechanical Vapor Recompression (shifting from injection wells to protect USDW designated formations);
2. Well Depth (deeper wells are more expensive following a generally linear trend with breakpoint for incremental prime mover horse power);
3. Well Count (more wells imply more first costs which increase linearly on an incremental basis);
4. TDS concentration of water (all equipment has to be sized for greater treatment, rate of cost increases tend to realize some scale up improvements); and
5. Boron concentration in water (boron treatment has substantial break points as boron concentration increases due to equipment selections and technology limitations).

Operationally, costs are adversely impacted by:

1. Inclusion of MVR to reduce volumes and to provide dilution water for boron;
2. Well depth costs are realized linearly as wells are drilled deeper in the form of higher costs for energy to lift the water;
3. Increases in well counts will create additional well service costs;
4. Higher TDS concentrations will increase the wear and tear, waste disposal and chemical costs; and

5. Higher boron concentrations will increase the wear and tear, waste disposal and chemical costs.

Well drilling cost sensitivity is very likely to be skewed to the low side. Operational experience in production in the Cat Canyon Oil Field dictates that in order to achieve 566 Gallons per day-household for 1799 households, the formation would have to flow over 1000 GPM. This is highly unlikely from the Sisquoc Formation (where the water cut from oil produced is typically below 50%) and is equally unlikely from the deeper Monterey (which has low porosity, limited permeability where not naturally fractured and an average depth of over 3000 feet.) This would imply the need for numerous smaller wells that would be speculative to establish, therefore the conservative four well model for electric driven water wells is used as a conservative tool for assessment. Realistically, the pricing of wells could triple if/when the deep water well drilling well drilling takes place. Also, given that the wells are drilled in the historic oil field they will require a higher degree of precaution than is normally associated with traditional water well drilling to shallower depth aquifers where normal water well drilling practices and equipment are adequate. The well count may be greater due to the individual confined segments. Wells that are drilled in historic oil producing fields for injection or production are expected to have similar well control criteria as those wells drilled for oil and gas production. Well drilling costs were checked with local drilling companies, (Hathaway, 2016).

For the purpose of Treatment Feasibility one must note that the wells from which the formation water quality data are gathered are DOGGR regulated wells that would be abandoned. The new wells for the drinking water project would likely be drilled and completed in formation space that has: 1) not been subjected to the influence of steaming and 2) any wells that are in proximity to past steaming can only recover the near radius capture of any lingering steam from the nearby (now abandoned wells). Thus, the yield of water would be that of connate water over the life of the water production project. The average producing well in Cat Canyon Oil Field has been 2.9 gallons per minute for the past 5 years, largely driven by condensate returns. The study assumes that water wells can be completed in a manner that results in 250 gpm production per well, if this were not the case then the well count alone for the analysis would drive the costs a hundred-fold, eclipsing the cost of the RO and the MVR, see Appendix II Formation Water Analysis as well as the Aquifer Exemption Expansion Application Study.

Conveyance was assumed to be above ground piping on sleepers, open canal conveyance is not readily available. Piping diameters were set based on common velocity criteria to optimize for pressure drop and first cost. Pipe size increments were fixed at specified common sizes. Piping estimations using industry cost data base and comparing results with other historic pipeline estimation methods were checked with local Engineering, Procurement and Construction. (Means, 2016)

The model facility was based on average water composition; economics relied on better economy of scale (using the California Average Households Served by Water Service Purveyor-1799 households as opposed to the smaller population of approximately 500 households served by Los Alamos CSD or 87 households in Sisquoc CDP served by Golden State Water Company). The treatment facility targets reducing TDS and boron.

Operating costs are the largest portion of the burden. The major cost components of the operating expenses of the system are:

- Lifting;
- Reverse Osmosis;
- Mechanical Vapor Recompression; and
- Softening.

Lastly, in this planning level study, the balance-of-plant (BOP) cost is associated with minor equipment that would be added to a more detailed process design, i.e., Ancillary components not in the scope of the major equipment, safety and comfort facilities, redundancy equipment, environmental mitigation, etc. Ten-percent of the Annualized All-In Cost was used to budget for balance-of-plant.

7 System Description

The basic lowest first cost system consisted of:

- Liquid (Water and Oil) /Vapor Separation to reduce free oil and natural gas,
- Filtration (including activated carbon media),
- Softening,
- Reverse Osmosis, and
- Mechanical Vapor Recompression.

All solid wastes from the treatment facility are hauled away.

A treatment system to achieve Serviceable Potable Water status for residential consumption will not achieve an acceptable level of boron for agricultural application. The boron concentration of the water from the public water treatment system is assumed to be lowered by use of existing volumes of low boron containing water for dilution in the same manner as the agricultural only analysis is based on.

7.1 Chemicals of Concern

California Secondary MCLs set the most restrictive target for drinking water quality. The chemicals of concern in this context are those associated with the high TDS and Boron in particular because of its impact on agriculture.¹⁹ (RWQCB) **Table 7.1-1** shows approved ranges for the TDS, Chlorides and Sulfates and specific limits for 13 chemicals, respectively.

“(d)

...

(3) *Constituent concentrations ranging to the short term contaminant level are acceptable only for existing community water systems on a **temporary basis pending construction of treatment facilities** or development of acceptable new water sources.*

(e) *New services from community water systems serving water which carries constituent concentrations between the Upper and Short Term contaminant levels shall be approved only:*

(1) *If adequate progress is being demonstrated toward providing water of improved mineral quality.*

(2) *For other compelling reasons approved by the Department.” [emph.] (22 CCR, 2006)*

¹⁹ Radon concentrations exceed the EPA proposed primary MCL of 300 pCi/l.

Table 7.1-1			
Maximum Contaminant Levels			
(22 CCR, 2006)			
Constituent, Units	Maximum Contaminant Level Ranges		
	Recommended	Upper	Short Term
Total Dissolved Solids, mg/l	500	1,000	1,500
or			
Specific Conductance, uScm	900	1,600	2,200
Chloride, mg/l	250	500	600
Sulfate, mg/l	250	500	600
Secondary Maximum Contaminant Levels			
“Consumer Acceptance Contaminant Levels”			
	Constituents Maximum Contaminant Levels/Units		
Aluminum	0.2 mg/l		
Color	15 Units		
Copper	1.0 mg/l		
Foaming Agents (MBAS)	0.5 mg/l		
Iron	0.3 mg/l		
Manganese	.05 mg/l		
Methyl-tert-butyl ether (MTBE)	0.005 mg/l		
Odor—Threshold	3 Units		
Silver	0.1 mg/l		
Thiobencarb	0.001 mg/l		
Turbidity	5 Units		
Zinc	5.0 mg/l		

7.1.1 TDS

Elevated total dissolved solids (TDS) concentrations are not deemed a health hazard. High total dissolved solids may affect the aesthetic quality of the water or interfere with washing clothes and corroding plumbing fixtures. For aesthetic reasons, a limit of 500 mg/l (milligrams per liter) has been established as part of the Secondary Drinking Water Standards. (EPA, 2012) An elevated TDS also carries the following concerns:

- The concentration of the dissolved ions may cause the water to be corrosive, salty, or have a brackish taste, result in scale formation, and interfere and decrease efficiency of hot water heaters; and
- Many high TDS waters may also contain elevated levels of ions that are above the Primary or Secondary Drinking Water Standards, such as: an elevated level of chlorides, iron, manganese boron, aluminum, copper, lead, etc. (Nalco, 2009)

7.1.2 Boron

EPA has issued a Health Advisory for boron. Based on the published Health Advisory, boron needs to be treated to less than 1 mg/l, which is the notification requirement level in California (Regional Water Quality Control Board) (USEPA, 2008). Additionally, Boron presents a problem for Domestic horticultural activities and agriculture. In this respect grapes show similar intolerance to boron as citrus and stone fruit trees, (Yermiyahu, Ben-Gal, & Sarig, 2006). Acceptable levels for Boron are lower for agriculture range to a lower value than the limit for Drinking Water, ranging between 0.2 to 2 mg/l, However a value of 0.7 mg/L is commonly used

depending on crop, (California State Water Board, 2017), (Central Coast Regional Water Quality Control Board, 2011).

The EPA health advisory for boron states the following:

“Treatment technologies do not influence the determination of whether or not a contaminant should be regulated. However, before a contaminant can be regulated with a national primary drinking water regulation (NPDWR), treatment technologies must be readily available. There is no evidence that boron and boron compounds are significantly removed by conventional treatments, such as coagulation/flocculation, sedimentation, and inert media filtration. Two treatment technologies that may be appropriate are ion exchange and reverse osmosis. Ion exchange involves the selective removal of charged inorganic species from water using an ion-specific resin. The surface of the ion exchange resin contains charged functional groups that hold ionic species by electrostatic attraction. As water passes by the resin, charged ions on the resin surface are exchanged for the contaminant species in the water. When all of the resin’s available exchange sites have been replaced with ions from the feed water, the resin is exhausted and must be regenerated or replaced. Wong (1984) evaluated eight technologies for their ability to remove boron from evaporator product water at power plants. Boron concentration in the evaporator product water averaged 11 mg/L, and ranged as high as 38 mg/L. Only three technologies successfully reduced boron levels to below 0.3 mg/L. These were a boron-specific ion exchange resin, a process of coagulation, precipitation and filtration, and a strong-base anion-exchange resin. Wong dismissed the coagulation, filtration, and filtration process as unacceptable due to high chemical dosage requirements and high operating cost. Of the two ion exchange methods, Wong determined that the strong-base anion exchange resin would have lower regeneration costs, at least in the case of the evaporator product water, which is low in dissolved solids. Reverse osmosis (RO) is similar to other membrane processes, such as ultrafiltration and nanofiltration, in that water passes through a semi-permeable membrane. However, in the case of RO, the membrane is non-porous. RO involves the use of applied hydraulic pressure to oppose the osmotic pressure across the membrane, forcing the water from the concentrated-solution side to the dilute-solution side. The water dissolves into the membrane, diffuses across, then dissolves out into the permeate. Most inorganic and many organic contaminants are rejected by the membrane and will be retained in the concentrate. Foster et al. (1980) tested hollow-fiber (HF) RO and spiral-wound (SW) RO in two separate treatment plants in New Mexico. At the treatment plant in San Jon, with influent boron levels of 0.75 mg/L, HF RO and SW RO removed 15 percent and 3 percent of boron, respectively. At Alamogordo, however, where influent concentrations were lower (0.09 mg/L), HF RO and SW RO were ineffective; in fact, boron concentrations rose to 0.14 mg/L and 0.13 mg/L, respectively. These findings suggest that the potential for RO use in boron treatment is limited.” (USEPA, 2008)

However, treatment for boron may be achieved (at higher operational costs) at a high pH using Lime Softening followed by Reverse Osmosis; however, the produced water must be treated to avoid premature failure of R.O. membranes, the R.O. inlet water must be filtered and pH closely managed, (Funston, 2002).²⁰ If a Boron-Specific Ion Exchanger is used in conjunction to meet the Agricultural Criteria, then the pH can be lowered throughout the system improving Softener performance, as well as extending RO maintenance cycles and membrane longevity.

7.1.3 Chlorides

High chlorides are commonly associated with high Sodium/highTDS water. (Hem, 1992) There are no known health effects associated from chlorides. Sodium, which is often associated with chloride, may be of concern with people suffering from heart or kidney disease. Effective treatment technologies include:

- reverse osmosis;
- distillation; and

²⁰ The study results were used in other exemption studies and it considered various options to treat produced water for industrial agricultural and drinking water uses. The design water contained approximately 6,000mg/l TDS and 20 mg/l Boron. The water was received after treatment, free of oil. The study assumed ready access to Class II wells injection of RO reject and other waste water.

- ion exchange.

7.1.4 Sulfates

Sulfates are typically associated with High TDS water. Sulfates are naturally occurring substances that are found in minerals, soil, and rocks. They are present in ambient air, groundwater, plants, and food.

Where drinking water contains high levels of sulfate or total dissolved solids, it should not be used in the preparation of powdered infant formula or nutritional supplements. An alternate low mineral water source should be used because laxative effects have not been observed with long-term exposures to sulfate-containing water. The data suggest that acclimatization occurs as exposures continue. (EPA, 2003)

7.1.5 Iron

Iron (in several forms) is typically associated with High TDS water. Iron is not hazardous to health, but it is considered a secondary or aesthetic contaminant. (EPA, 2012) Dissolved ferrous iron gives water a disagreeable metallic taste. When the iron combines with tea, coffee, and other beverages, it produces an inky, black appearance and a harsh, unacceptable taste. Vegetables cooked in water containing excessive iron turn dark and look unappealing.

Concentrations of iron as low as 0.3 mg/L will leave reddish brown stains on fixtures, tableware and laundry that is very hard to remove. When these deposits break loose from water piping, rusty water will flow through the faucet; eventually corrosion will clog valves and equipment.

7.1.6 Manganese

Manganese may cause adverse neurological effects. The primary target of manganese toxicity is the nervous system. Manganese has very low toxicity by oral ingestion and reports of adverse effects by this route are rare. (EPA, 2003)

7.1.7 Radionuclides

Exposure to radioactivity may be harmful to chemical reactions important to living cells in the body. Low level radiation pulls electrons off atoms in the cells (ionizes them) and may prevent the cell from functioning properly. It may lead to the cell's death, to the cell's inability to repair itself, or to the cell's uncontrolled growth (cancer). For example, ionizing radiation can damage DNA, which carries the genetic information in a cell. Damage to DNA may change the cell's genetic code, resulting in the mutation of one or more genes contained in the DNA. These mutations can cause cells to malfunction or lead to cancer. These mutations may also be passed on to children. (EPA, 2015)

EPA has limits in drinking water called maximum contaminant levels (MCLs) for four groupings of radionuclides: One MCL is a limitation on two kinds (or "isotopes") of radium: radium-226 (Ra-226), which mostly emits alpha radiation, Ra- 228, which mostly emits beta radiation. Another MCL limits radiation from a group of 179 man-made beta and photon emitters. The third MCL is for "gross alpha" which includes all alpha emitters except uranium and radon. Fourth is a MCL for uranium isotopes U-234, U-235 and U-238, which mostly emit alpha radiation. This last MCL is actually concerned primarily about limiting the toxic effects of uranium as a heavy metal as much as its effect as a radionuclide. (EPA, 2015)

7.1.7.1 Radon

Radon found in an aquifer is due to the decay of radium in the bedrock containing the aquifer. Aquifers that have a more heterogeneous mixture of materials, such as sandstone or sand and gravel, typically do not have high radon concentrations or large fluctuation in radon concentrations.

The radon concentration in a well can fluctuate. Anytime a well is pumped, the water table will be lowered. The rate of recharge (water moving back into the aquifer) and the rate of pumping from a well will determine the level of the water table. As the water level changes, the water will be drawn from a different area of the aquifer. If the radon concentrations are different in these areas, the radon concentrations in the well water will change.

Presently, the State Regional Water Quality Control Board lists the EPA proposed Primary MCL of 300 pCi/L for Radon.²¹

8 Analysis Procedure 1: Facility Design

8.1 Design Discussion

8.1.1.1 Water Treatment Equipment

Figure 5.1-1, Process Flow Diagram, Sisquoc Sands and Monterey Formation and Figure 5.1-2, Process Flow Diagram, East Area, shows the selected design for the treatment to achieve Drinking Water Standards. The treatment includes provisions to remove Oil/Grease and Natural Gas, Hardness and Total Suspended Solids.

Pumping

All pumps are considered to be electrically driven using approved CPUC rate tariffs. (PG&E, 2016) The annual average rate was estimated to be the current E-20 rate of 16.7 ¢/kWh flat for 20 years, assuming the water service company could meet PG&E's E-20 Secondary Service Tariff criteria and electricity rates do not increase. Any first cost related to the electrical infrastructure was not included assuming the Utility provider would make interconnection and imbed the costs in the electricity rate subject to CPUC approval using the historic infrastructure for service drops.

Offsite Disposal

The preferred disposal method for solid waste is truck to the existing management facilities Santa Maria Regional Landfill operated by the City of Santa Maria or the Tajiguas Landfill operated by the County of Santa Barbara.

Pipeline

Typical pipe diameters are selected based on 3 to 10 feet per second as the design velocity, depending on pressure drop considerations. Typically, the pipeline sizing criteria velocity was 7 feet per second; to ensure low pressure drop, the next larger pipe size was selected when the velocity was at or near 7 feet per second. (Crane, 1976) The pipe was run above ground. For practical purposes with low flow rates such as this (where a 2-inch pipe might suffice), an 8-inch pipe diameter was selected (\$70/foot) to ensure structural integrity in the pipe for the project life.

²¹ Applies only to second value if two separate values are listed; applies to range if a range of values is listed.

(Means, 2016) The pipeline route would follow section and quarter section lines and would connect to a CSD at the closest point of connection.

Pipelines were costed using R.S. Means. (Means, 2016) No adder was included to reflect the local issues of routing a pipeline across biologically sensitive habitat or streambed crossings, both of which would require consultation and/or mitigation for disturbance. The pipeline material selected is commonly available ASTM Schedule 40 steel pipe.

9 Analysis Procedure 2: Determine Size of Hypothetical User Population

9.1 Maximum Yield Based Estimate

In this particular analysis, the Maximum Yield Case was not considered due to the constraints on groundwater pumping driven by the low water cuts and weight of the viscosity of the formation fluids. The community selected as the typical target community is the unincorporated community of Los Alamos CSD at a distance of 3 miles. Any emergency-driven regulatory relief allowing hypothetical groundwater pumping to serve the CSDs in the area was assumed to facilitate a least cost treatment facility. The facility sizing presumed a larger rate base of 1799 households to capture economy-of-scale as if the proposed facility and subject Oil Field Area-specific formation could be tasked to meet the state average house hold based demand (a given area's formation could actually yield 1.5 million gallons per day for 20 years, the economic horizon, see Section 11).

9.2 California State Average Households Case

In this particular analysis, the California Average Households Case was considered due to the economy of scale provided by the larger rate base of households served as opposed to the smaller Los Alamos CSD rate base. Emergency permission granted to CSDs by the duly designated authority under the SGMA is considered to be focused on regional issues related to severe drought and a larger facility may be required under these conditions to supply other nearby water users as directed by the SGMA.

9.3 CDP Household Count Case

This design case was not selected since the planning level analysis was intended to conservatively present the lowest practical cost hurdles. The largest nearby CSP is Los Alamos CSP, reported 553 households served by the LACSD, (US Bureau of Labor and Statistics). A larger facility and larger service population was used to obtain a lower cost of service due to the economy of scale.

10 Analysis Procedure 3: Establish Mean Annual HH Income (\$89,903)

Based on Bureau of Labor Statistics, the Santa Barbara County Mean Annual House Hold Income is \$89,903 and Los Alamos CDP is \$83,499. (US Bureau of Labor and Statistics)

11 Analysis Procedure 4: Estimate Annualized Cost of Water Supply System

Capital and operations and maintenance were estimated using EPA Estimating Water Treatment Costs, Volume 2, 1979. All Costs were adjusted to 2016 dollars primarily using the Engineering

News Record Construction Cost Index or by using the current energy cost applied to annual energy consumption.

All-In Costs Including Service and Distribution

EPA guidance dictates that the comparison be based on an All-In cost. The cost of surface easements would be market-based and the issue of split estate for the entire confined portion of the subject formation is either a takings matter, a settled trespass of a specific lease (where a water well is producing and wasting or selling oil owned by a mineral rights owner), or a case-by-case contractual matter for the entire confined portion of the subject formation. These substantial and unresolved cost elements (along with Distribution and Service) are not included in the lower value used in the test. No effort was made to include these tangible costs provided that the EPA criteria were met with the easier to obtain lesser cost (i.e., minus the other otherwise unknown easement and split estate costs as well as Distribution and Service). Delivery and service costs are typically 60% to 68% of the all-in cost for a metered delivery to a residence on a national basis, (Guidelines Appendix G). A review of CPUC ratemaking information indicates that California companies typically have higher delivery and service costs; thus the values being used in the test (Table 3.0-1: Economic Feasibility Summary-to Treat Sisquoc Sands and Monterey Formation Water) are adjusted by 62% to account for the Service and Delivery component of the all-in cost.²²

Table 11.0-1 shows the economic values used in the analysis:

Table 11.0-1: Economic Base	
Capital	
Dollar	2017
Interest Rate	7%
Term	20 Years
Imputed Factor	0.1
O&M	
Diesel	\$3.00/gal
Electricity	\$16.7/kWh

²² A review of California Water Services Urban Water Management Plan indicate that CWS adds 88% for Distribution and Services to the cost of water in the Bakersfield Service Territory. A review of American States Water 10K for 2016 shows the Water Gross Margin is \$229 million on Water related revenues of \$302 million, CPUC water costs are \$73 million and the operating expenses for Administration and General plus Maintenance and other is \$124 million; costs allocated to Service and Delivery are 62%, ignoring other P&L lines.

The initial design composition is specified in **Table 11.0-2**.

Table 11.0-2: Design Composition(mg/L)							
Area	Formation		TDS	B	Na	CL	SO4
Sisquoc Area	LOW CASE: Post Steaming Production Sisquoc Formation	Mean	5707	25	961	1756	75
		Std Dev.	2422	9	426	980	46
		Count	22	20	22	22	22
	SISQUOC CASE: Native Sisquoc Formation	Mean	22216	27	1847	7794	295
		Std Dev.	7063	20	1142	2348	500
		Count	9	2	6	7	5
Gato Ridge	Monterey	Mean	9226	30	1789	3207	29
		Std Dev.	1041	14	540	374	11
		Count	49	38	39	49	49

Table 11.0-3 shows the resultant process data for the planning level design facility for each of the three design cases.

Table 11.0-3: Process Results

	Water Wells 1				Facility Inlet 2				Gas/Oil/Water Separation 3				Dissolved Air Flotation 4				Lime Softener 5			
	Wells	Depth of Wells	Fac. Feed Rate from Wells	Per Well Flow	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH
			MGPD	GPM	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l
Low Case	4	2,000	1.48	250	1.48	5,707	25.00	2000	1.48	5,707	25.00	5	1.48	5,707	25.00	5	1.48	5,707	11.25	1
Sisquoc	4	2,000	1.48	250	1.48	22,216	27.00	2000	1.48	22,216	27.00	5	1.48	22,216	27.00	5	1.48	22,216	12.15	1
Monterey	4	3,000	1.48	250	1.48	9,226	30.00	2000	1.48	9,226	30.00	5	1.48	9,226	30.00	5	1.48	9,226	13.50	1

	Pressure Filtration 6				Reverse Osmosis 7				Boron Specific Ion Exchange 8				Mechanical Vapor Recompression Unit (Distillate) 9				Storage Tanks to Community (includes MVR Distillate) 10			MVR to Sludge Pen 11			Offsite Disposal 12	
	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	Flow	TDS	Boron	Rate	Composition (Moist Sludge)
	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	TPD	%	mg/l	CUF/D	%
Low Case	1.46	5,707	11.25	1	0.94	356.69	3.04	0	0.84	357	3.04	0	0.27	0	0.00	0	1.20	277.38	2.36	177	15	na	4133.43	50%
Sisquoc	1.46	22,216	12.15	1	0.94	1388.50	3.28	0.00	0.84	1,386	1.00	0	0.27	0.00	0.00	0.00	1.20	970.41	0.72	531	15	na	12400.30	50%
Monterey	1.46	9,226	13.50	1	0.94	576.63	3.65	0.00	0.84	574	1.00	0	0.27	0.00	0.00	0.00	1.20	401.94	0.72	354	15	na	8134.98	50%

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Appendices

Appendix I

Water Wells

Basis

California Average Household occupants	1799	194 gpd/person	
Electricity	2.92	5253.08	
Res. Per HH Water Consum	0.152 \$/kWh		
	206765.2 GPY/HH		
	566.48 GPD/HH	8,856,442.73 bbl/yr	
		69% Residential Use	
		12,835,424.25	12.83542425 mbbbl/yr
			Sizing criteria

Inlet Conditions:

Flow	12,835,424.25 bbl/yr	1.476953 MGD	1025.661755 GPM
Pressure	100.00 psig		
TDS	5862.00 mg/l	Based on Sisquoc Condensate	
Boron	26.00 mg/l		
Iron	0.00 mg/l		
Chloride	1924.00 mg/l		
Sulfate	75.00 mg/l		
Oil	10.00 %		
Gas	11.14 scf/bb		

Outlet Conditions:

Flow	12,835,424.25 bbl/yr	1.476953 MGD
Pressure	100.00 psig	
TDS	5862.00 mg/l	
Boron	26.00 mg/l	
Iron	0.00 mg/l	
Chloride	1924.00 mg/l	
Sulfate	75.00 mg/l	
Oil	10.00 TPH, mg/l	
Gas	11.14 Methane, mg/l	

Well(s) capacity 1025.661755
 Well Depth 2,000
 Units 4
 Individual Well Output 250

Capital Costs

Unit cost 610 \$/ft
 Single Well Cost \$ 1,220,000.00 To completion
 Well Count \$ 4
 Total Well Cost \$ 5,005,229.37

Operational Costs

Electricity 0.167 \$/kWh

Energy Use 740.0156964 hp 6905867 kWh

Well Lifting Costs \$ 1,153,279.82 per year

Table 11.0-2: Design Composition(mg/L)

Area	Formation		TDS	B	Na	CL	SO4
Sisquoc Area	Post Steaming Production Sisquoc	Mean	5862	26	961	1924	75
		Std Dev.	2600	9	426	1200	46
		Count	27	25	22	27	22
	CASE: Native Sisquoc Formation	Mean	20123	28	1847	7295	295
		Std Dev.	7871	15	1142	2360	500
		Count	11	3	6	9	5
Gato Ridge	Monterey	Mean	9990	26	1151	3266	116
		Std Dev.	8028	9	721	2812	218
		Count	38	28	28	36	27

	Water Wells 1				Facility Inlet 2				Gas/Oil/Water Separation 3				Dissolved Air Flotation 4				Lime Softener 5							
	Wells	Depth of Wells	Fac. Feed Rate from Wells	Per Well Flow	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH				
			MGPD	GPM	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l				
Monterey	4	3,000	1.48	250	1.48	9,118	29.00	2000	1.48	9,118	29.00	5	1.48	9,118	29.00	5	1.48	9,118	13.05	1				
	Pressure Filtration 6				Reverse Osmosis 7				Boron Specific Ion Exchange 8				Mechanical Vapor Recompression Unit (Distillate) 9				Storage Tanks to Community (includes MVR Distillate) 10			MVR to Sludge Pen 11			Offsite Disposal 12	
	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	Flow	TDS	Boron	Rate	Composition (Moist Sludge)
	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	TPD	%	mg/l	CUF/D	%
Monterey	1.46	9,118	13.05	1	0.94	569.88	3.52	0.00	0.84	567	1.00	0	0.27	0.00	0.00	0.00	1.20	397.30	0.72	354	15	na	8134.98	50%

Los Alamos CSD Households Served
BLS Data - Santa Barbara County
PG&E
Los Alamos CSD Households Served
Los Alamos CSD Households Served

	Water Wells 1				Facility Inlet 2				Gas/Oil/Water Separation 3				Dissolved Air Flotation 4				Lime Softener 5			
	Wells	Depth of Wells	Fac. Feed Rate from Wells	Per Well Flow	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH
Sisquoc	4	2,000	MGPD 1.48	GPM 250	MGPD 1.48	mg/l 19,862	mg/l 34.00	mg/l 2000	MGPD 1.48	mg/l 19,862	mg/l 34.00	mg/l 5	MGPD 1.48	mg/l 19,862	mg/l 34.00	mg/l 5	MGPD 1.48	mg/l 19,862	mg/l 15.30	mg/l 1

	Pressure Filtration 6				Reverse Osmosis 7				Boron Specific Ion Exchange 8				Mechanical Vapor Recompression Unit (Distillate) 9				Storage Tanks to Community (includes MVR Distillate) 10			MVR to Sludge Pen 11			Offsite Disposal 12	
	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	TPH	Flow	TDS	Boron	Flow	TDS	Boron	Rate	Composition (Moist Sludge)
	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	mg/l	MGPD	mg/l	mg/l	TPD	%	mg/l	CUF/D	%
Sisquoc	1.46	19,862	15.30	1	0.94	1241.38	4.13	0.00	0.84	1,238	1.00	0	0.27	0.00	0.00	0.00	1.20	866.84	0.72	531	15	na	12400.30	50%

Appendix II



**Analysis of Formation Water Chemistry
Cat Canyon Oil Field**

Santa Barbara County, California

August 2017

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Appendices

Appendix I	Original Data Table with All Starting Data
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1 Executive Overview

1.1 Area of Review

The Sisquoc Sands and Monterey Formation in the Cat Canyon Oil Field are hydrocarbon bearing and producing with the assistance of steam injection and water flood for enhanced recovery and water re-injection. Water re-injection and gas re-injection into the exempted areas are currently utilized as part of the current Maximum Efficient Rate (MER). **Figure 1.1-1, Proposed Aquifer Exemption Study Area**, shows the location of Proposed Aquifer Exemption Expansion Areas in the Cat Canyon Oil Field. Historic exemption status was not consistent with the producing areas at the time of the original delegation by US Environmental Protection Agency (EPA).

The Treatability Feasibility Study will present three cases from this Analysis of Formation Chemistry: high, medium and low. The Low Case being a conservative case in which low TDS and low boron are considered as if ideal conditions could result in sufficient production of previously injected steam (now condensate) to meet the minimum production hurdle, **Appendix 6-I, Treatment Feasibility Study in the Aquifer Exemption Expansion Study**.

1.2 Summary of Results

Table 1.2-1, Summary of Historic Exemption and Proposed Expansion by Area shows the historic status and the proposed exemptions by five (5) Areas within Cat Canyon Oil Field (Central, West, East, Sisquoc and Gato Ridge). The producing areas and the exemption study area are shown on **Figure 1.2-1, DOGGR Producing Area Map (1973)**.

The Monterey Formation and the Sisquoc Sands produce oil within the Cat Canyon Oil Field. The formations contain water with average Total Dissolved Solids (TDS) ranging from 7,668 mg/L (East Area Sisquoc Sands) to 19,821 mg/L (Sisquoc Area, Sisquoc Sands) as shown in **Table 1.2-2, Summary of Reviewed Data by Area and Formation**.

Re-injected water in the Cat Canyon Oil Field includes steam injection (into the Sisquoc Sands), water flood and some disposal. Produced water re-injection is considered a critical production activity necessary for enhanced oil recovery. Produced gas which cannot be used or sold is re-injected with the produced water in some instances where appropriate.

Table 1.2-1: Summary of Historic Exemption and Proposed Expansion by Area				
Current Exemption		Proposed Expansion		Description of Expansion
Formation	Interval/Sand	Formation	Interval/Sand	
Central Area:				
Sisquoc	Sisquoc	Sisquoc	Sisquoc	Expand Area
		Monterey	Monterey	Add Monterey
East Area:				
Sisquoc	Sisquoc	Sisquoc	Sisquoc	Expand Area and consolidate Brooks
Sisquoc	Brooks			
Monterey	Monterey	Monterey	Monterey	Expand Area
West Area:				
Sisquoc	S1b	Sisquoc	Sisquoc	Expand Area and include all Sisquoc Sands
Sisquoc	Los Flores (S9-S10)			
Monterey	Cherty Zone	Monterey	Monterey	Expand Area and include all Monterey formation
Sisquoc Area:				
Sisquoc	Sisquoc	Sisquoc	Sisquoc	Expand Area, consolidate Thomas and add Brooks
Sisquoc	Thomas			
Monterey	Monterey	Monterey	Monterey	Expand Area
Gato Ridge:				
Sisquoc	Sisquoc	Sisquoc	Sisquoc	Expand Area
Monterey	Buff and Brown	Monterey	Monterey	Expand Area and include all Monterey formation

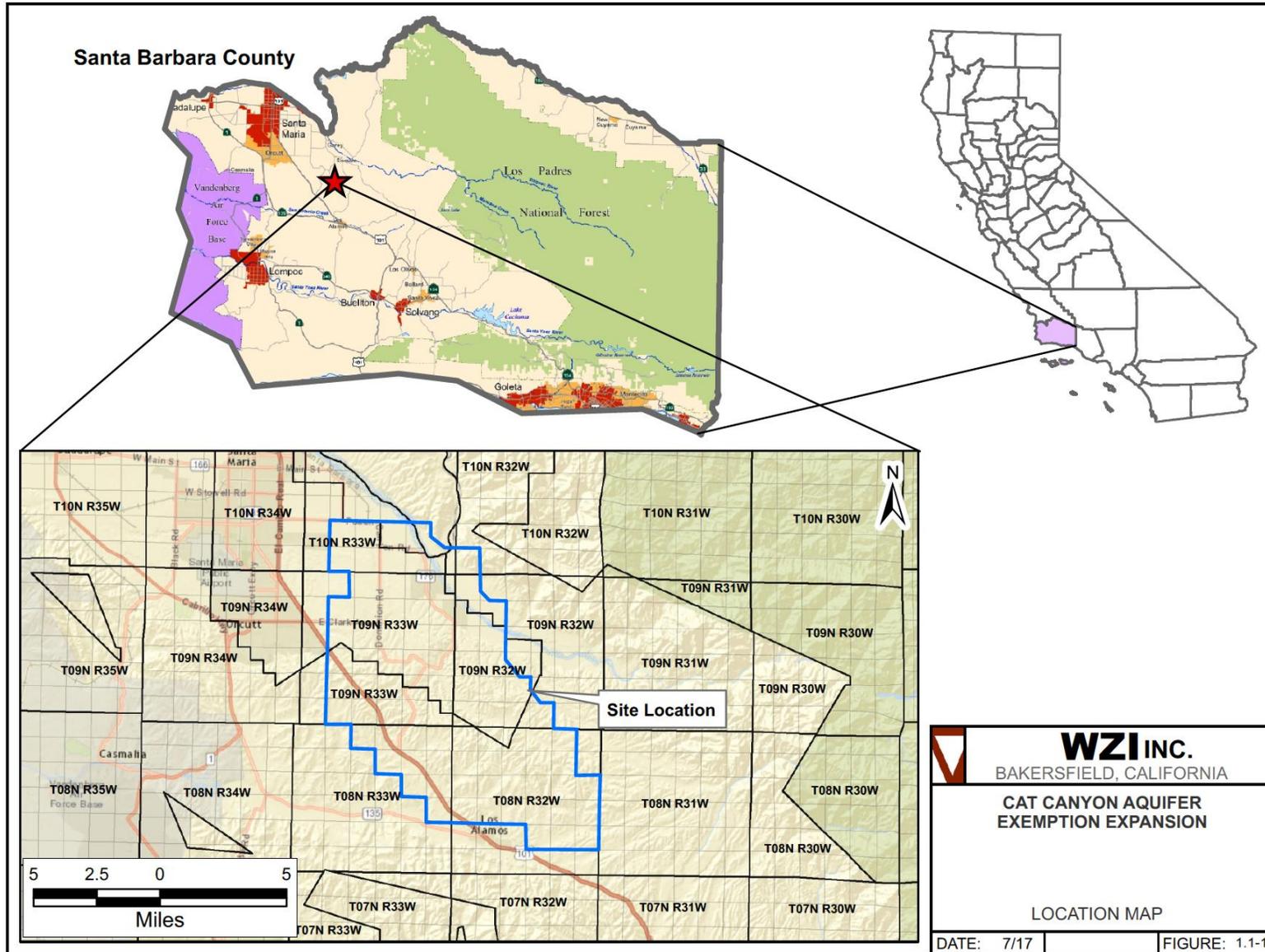


Figure 1.2

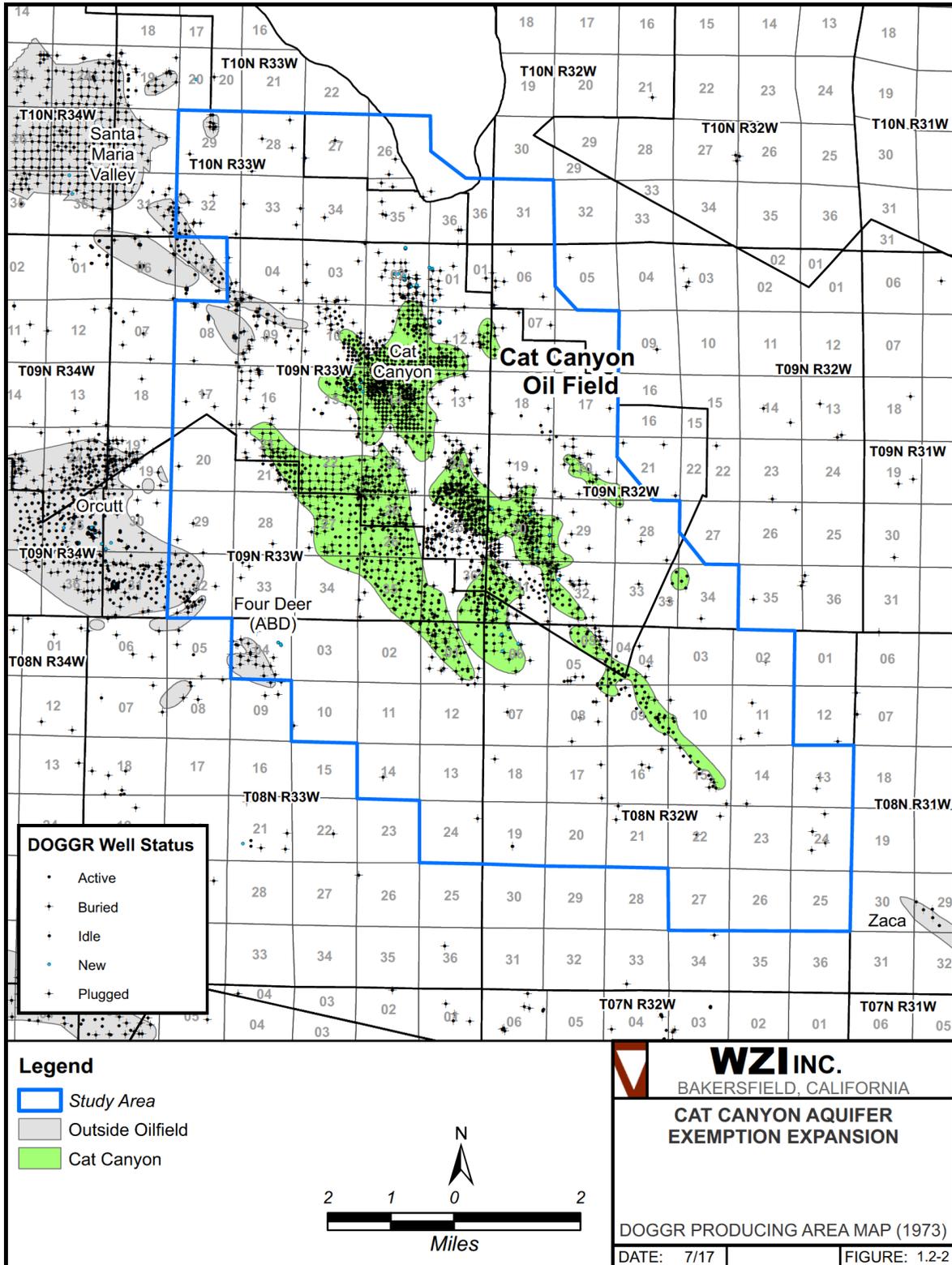


Figure 1.2-2

Table 1.2-2: Summary of Reviewed Data by Area and Formation(mg/L)											
Area	Formation		TDS	B	Na	CL	SO4	HCO3	Ca	K	Mg
Sisquoc	Average Sisquoc	Mean	9990	26	1151	3266	116	4680	110	47	214
		Std Dev.	8028	9	721	2812	218	5196	51	59	177
		Count	38	28	28	36	27	29	9	27	27
	Post Steaming Production	Mean	5862	26	961	1924	75	2209	104	41	247
		Std Dev.	2600	9	426	1200	46	1572	50	60	179
		Count	27	25	22	27	22	22	8	22	21
	Native Sisquoc Formation	Mean	19862	34	2311	7436	295	11004	113	71	91
		Std Dev.	7558	17	1612	2269	500	6143	67	46	113
		Count	12	4	7	10	5	8	2	6	7
	Monterey	Mean	10417	7	1153	3216	57	4657	82	26	98
		Std Dev.	6445	5	798	1828	51	2395	73	23	82
		Count	14	14	14	14	14	14	6	14	12
Central	Sisquoc	Mean	10745	28	1641	4001	47	5539	29	36	21
		Std Dev.	3815	20	801	1420	22	2496	8	24	17
		Count	14	11	11	11	11	11	4	11	8
	Monterey	Mean	12314	19	1188	4033	67	5109	44	41	56
		Std Dev.	6823	22	454	1958	87	2221	7	68	37
		Count	17	7	16	16	17	17	5	16	15
East	Monterey	Mean	10417	7	1153	3216	57	4657	82	26	98
		Std Dev.	6445	5	798	1828	51	2395	73	23	82
		Count	14	14	14	14	14	14	6	14	12
	Sisquoc	Mean	7668	12	1263	2740	27	3528	41	16	75
		Std Dev.	2547	12	768	1019	20	1806	12	11	51
		Count	17	9	14	14	14	14	2	13	13
West	Monterey	Mean	12314	19	1188	4033	67	5109	44	41	56
		Std Dev.	6823	22	454	1958	87	2221	7	68	37
		Count	17	7	16	16	17	17	5	16	15
	Sisquoc	Mean	22007	42	876	8063	147	12252	15	50	49
		Std Dev.	5280	29	442	2096	103	3700		28	94
		Count	9	5	8	8	8	8	1	8	5
Gato Ridge	Monterey	Mean	9118	29	1769	3207	29	4003	41	14	62
		Std Dev.	1151	14	528	367	11	698	11	10	74
		Count	55	40	42	51	52	42	5	40	34
	Sisquoc	Mean	21000								
		Std Dev.									
		Count	1								
	Sisquoc/ Monterey	Mean	6333								
		Std Dev.	153								
		Count	3								

1.3 Cyclic Steam Issues in Sisquoc Sands

There is strong evidence supporting the conclusion that a statistical bias is present in the formation water quality data due to sampling cyclic steam condensate. Condensate dilutes whatever actual connate formation water is released during post steam injection oil production.

Cyclic production will return the steam (as condensate) or injected water as part of the enhanced oil recovery process. The production fluid returns have higher water cuts than the native formation would provide. In the course of the life of the EOR project, once the production from a particular well becomes uneconomic, no more steam will be injected; the well may be re-tasked, idled or abandoned.

Any sampling efforts on cyclic steamed wells to determine the actual formation connate water should only take place immediately before the next scheduled cycle of steam injection and even then the samples may be confounded by previous injection of fresher water as steam. The increased number of cycles leaves condensate in the pore space near the well bore and the nearby portion of the capture radius.

Mass balance indicates that all steam is not recovered. The altered porosity, hydraulic conductivity, storativity and voidage created by the cyclic removal of hydrocarbons will facilitate capture of the enhanced recovery fluids (particularly water), in the affected zone around a given cyclic well. Storativity increases as oil is removed from the capture radius of the individual well. If all condensate were able to be produced from a well's capture area, the water composition would approach formation conditions (with commensurate sharp decline in produced water) and a simple plot of the Total Dissolved Solids, (TDS), vs. volume of water pumped and water cut will show an asymptotic approach to the connate formation TDS composition. A native connate water sample for the Sisquoc sands is difficult to collect due to the water producing nature of the actual Sisquoc Sands beyond the specific injection wells' zone of influence (i.e., without steam influence). A more detailed discussion of the Sisquoc formation water sampling is included in the Sisquoc Area discussion in **Section 2.5, Final Results**.

1.4 Cautionary Note

For the purpose of the Aquifer Exemption determination, the data indicate that the East Area Sisquoc Sands are still subject to the review for exemption status since the TDS average is below 10,000 mg/L and there is no adequate historic sampling or other documentation to justify adjustment at the time of this report. However, it is important to caution against any regulatory based determination that might create a false expectation that the Sisquoc Sands (as a whole) contains adequate supplies of low TDS water accessible at the actual formation conditions (under which water may be produced for drinking purposes). The Aquifer Exemption Expansion Application Study addresses the hydrogeology and the Treatment Feasibility Study addresses the sensitivity of the economics in the context of actual formation conditions and drawdown capability of the actual formation.

1.5 Method Notes

1.5.1 Assessing TDS veracity and corrections of Borate to Boron

The preferential order for assessing reliability of methodology for Total Dissolved Solids (TDS) is Gravimetric Method, followed by Lab Summation, followed by summation of report (HCO_x0.67), EC based (conversion factor= 0.73). Some of the deviation within general formation data is due to the variation between TDS reporting methods. Instances of unusually high boron values are interpreted to be improperly recorded borate values (borates are approximately 4 times heavier than boron). For analysis in this report, the unusually high borate values were corrected to boron where possible.

1.5.2 No Mass Weighting Assigned to Samples

All samples were assumed to carry equal weighting on a mass basis.

1.5.3 Assignment of sample to Well Numbers

As the review process proceeded through the rejection cycle all API numbers were assigned to wells (where possible) and all area designations were verified. Completions were checked for identified wells where no completion data was provided.

1.5.4 Focused Constituents

While other constituents are available for consideration, primary focus is given to TDS and boron due to their singular relevance to regulatory criteria related to exemption at either the federal or state level or agricultural interest. High Sulfate also presents a problem primarily for infants drinking formula. Other constituents are considered in determining whether a sample is from well control fluids or post steam injection returns.

2 Data Review

2.1 Rejection Pass 0: Review of All Raw Data

The focus of this analysis is to determine the formation water quality. No effort is made to assess impacts of the specific oil field operational practices other than to reject data not representative of the formation's water composition or to explain its use. There are several expected bias sources on which this statistical study will be focused: multiple isolated sands, steam injection, water floods, produced water reinjection, well control fluids, and faults. No steaming was found taking place in the Monterey formation, therefore no dilution of returning produced water is anticipated. Combined injection samples such as tank samples (due to the question of origin) will be rejected however, samples properly gathered to determine receiving formation composition for wells designated as WD pursuant to UIC PALs are utilized. Operationally, returned (post steam injection) water from cyclic steamed,(SC), wells in production phase is diluted with fresher make-up water prior to return as injection at other SC wells in the injection phase.

Appendix I, Original Data Table with All Starting Data, contains all data submitted in support of the analysis. Some records were removed from this data set and others were added as new information was made available during the development of this study. All support documentation can be found in **Appendix III, All Lab Sheets and Support Information**. There were originally 208 records of which 11 were from samples from adjacent oil fields (Santa Maria Valley Oil Field and Zaca Oil Field), **Appendix III**. These were immediately impounded from the Cat Canyon Oil Field Data for the purpose of defining the formation water quality in the specific producing areas of Cat Canyon Oil Field Aquifer Exemption Expansion Area. These impounded records were retained for analysis of the northern extent of the Cat Canyon Aquifer Exemption Expansion Study Area which does intrude in to the Santa Maria Oil Field, See **Table 2.1-1, Non-Cat Canyon Data**. All duplicates were reviewed and once any contrary comments were resolved the duplicate samples were removed.

Table 2.1-1 Non-Cat Canyon Data

Area	Lease	Well Name/Description	Date	API Number	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
SMV Nicholson	Nicholson	Nicholson waste water	7/17/1972			Monterey		34500	13.99124
SMV Golco	Golco	Golco waste water	7/17/1972			Monterey		33765	13.99124
SMV Lakeview	Lakeview	Lakeview waste water	1/12/1982			Monterey		30707	
SMV Bradley	Bradley Consolidated	Bradley Consolidated 1-37	9/5/1984	8320545	Well	Sisquoc	Basal Sisquoc	28678	97.93868
SMV Main	Hopkins	Hopkins Lease Injection water	5/27/1976			Sisquoc	Basal Sisquoc	24672	10.66132
SMV Clark	Edmonston	Edmonston waste water	7/17/1972			Monterey		24625	27.98248
SMV Clark	Lakeview	Lakeview waste water	7/17/1972			Monterey		23370	20.98686
SMV Bradley	Bradley	RR Bradley 1 Inj	7/15/1988	8320441	Well	Monterey		13700	5.596496
SMV Bradley	Bradley	RR Bradley 1 Prod	8/30/1972	8320441		Monterey		12547	6.99562
SMV Bradley	Bradley	BRADLEY #2		8300301		Monterey		12400	0
ZACA Oil Field	Chamberlin (Zaca)	Chamberlin 1-2	2/10/2012	8322624		Monterey		8530	9.514043

The data set is relatively robust for all producing areas even when incomplete records are rejected; **Figure 2.1-1, Pass 0, All Areas**. There are fewer boron values than TDS values. Prior to analysis, each data for formation were separated in the Data Review (Pass 1, 2 and 3) by Area and Formation. Any incomplete data are noted by “??” and are reviewed during subsequent passes for completion of the missing information. If during the course of the study, data for a rejected record were found to complete the information, it is returned to the surviving cohort. **Table 2.1-2, Summary of All Data by Area (mg/L)**, summarizes all of the original Cat Canyon Oil Field data by area without any rejection other than removal of duplicates and SMV records. Note that even the unknown area records have a high TDS (8,223 mg/L) and high boron (36 mg/L), indicating that if all records with undefined area “??” were rejected they would not have materially lowered the Low Case design water composition value (5,707, mg/L) used in the Treatment Feasibility Study.

Figure 2.1-2, shows the coherently distributed data clusters (highlighted by black lines) are revealed in the probability plots for the data. These clusters may be associated with different areas, formations or consistent sample bias.

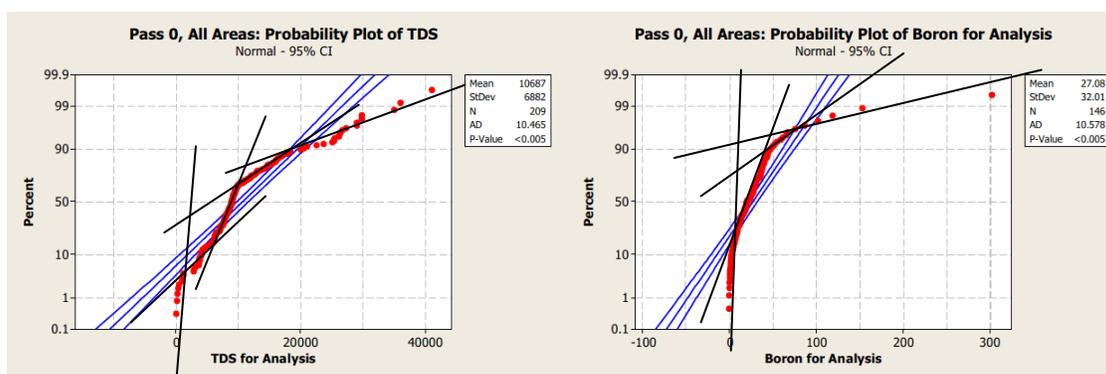


Figure 2.1-1

Figure 2.1-2, shows the probability plot of the data when broken out by area and formation. These data are examined in detail by area and formation in subsequent passes.

Table 2.1-2: Summary of All Data by Area (mg/L)

		TDS	B	HCO3	Na	Ca	CL	Mg	SO4
??	Mean	8,223.50	36.00	1,640.00	2,607.00	53.50	3,950.00	20.00	16.00
	Standard Deviation	956.72	-	226.27	151.32	3.54	353.55	14.14	-
	Count	2	1	2	2	2	2	2	1
Central	Mean	9,936.50	26.48	1,662.54	3,875.68	47.55	5,385.84	35.81	20.06
	Standard Deviation	4,458.61	20.25	767.49	1,421.56	21.17	2,438.74	23.36	15.81
	Count	16	13	12	12	12	12	12	9
East	Mean	8,292.14	9.41	1,178.49	2,740.89	46.81	3,725.46	20.88	97.17
	Standard Deviation	6,742.91	11.76	1,014.10	2,246.66	39.10	3,120.41	17.51	80.44
	Count	43	33	40	40	40	40	40	40
Gato Ridge	Mean	9,357.46	29.57	1,716.93	3,319.47	29.48	3,875.34	14.58	61.08
	Standard Deviation	3,720.71	19.45	528.44	851.66	11.62	871.43	9.58	70.23
	Count	70	47	48	60	62	50	47	40
Olivera	Mean	16,782.50	-	2,290.00	5,967.50	91.50	7,890.00	61.50	447.50
	Standard Deviation	15,031.31	-	2,205.48	5,580.09	27.14	7,286.16	19.05	37.53
	Count	4	-	4	4	4	4	4	4
Sisquoc	Mean	11,081.61	29.86	1,144.85	3,512.94	132.36	5,224.63	61.12	191.96
	Standard Deviation	8,767.66	18.03	602.97	2,783.89	225.86	5,068.45	94.09	175.25
	Count	42	32	37	39	37	39	37	36
West	Mean	15,770.76	45.85	1,408.99	5,423.60	82.12	7,367.54	38.24	76.79
	Standard Deviation	6,932.11	70.26	823.98	2,432.25	87.59	3,805.37	50.44	77.39
	Count	34	20	32	32	33	33	32	28

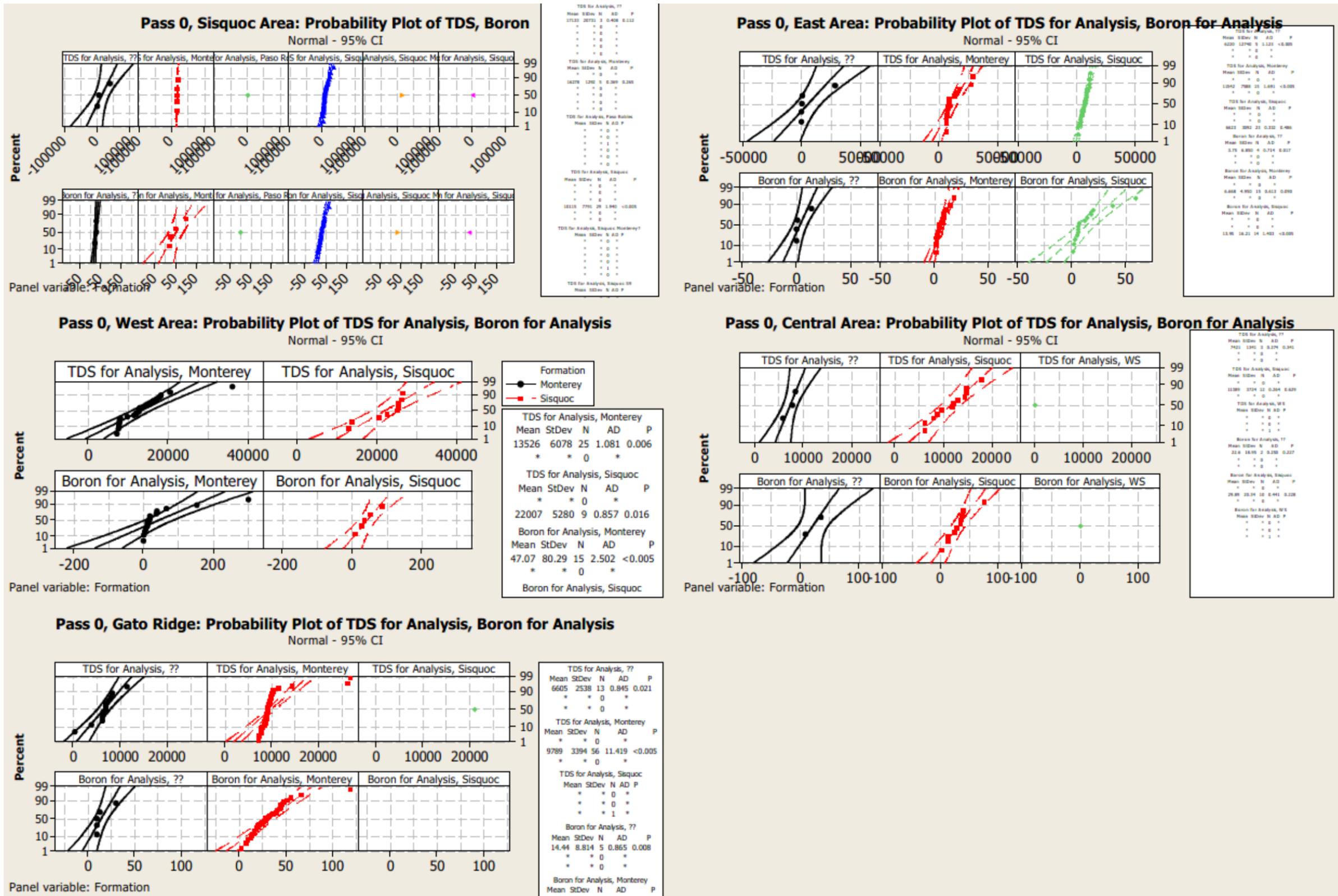


Figure 2.1-2

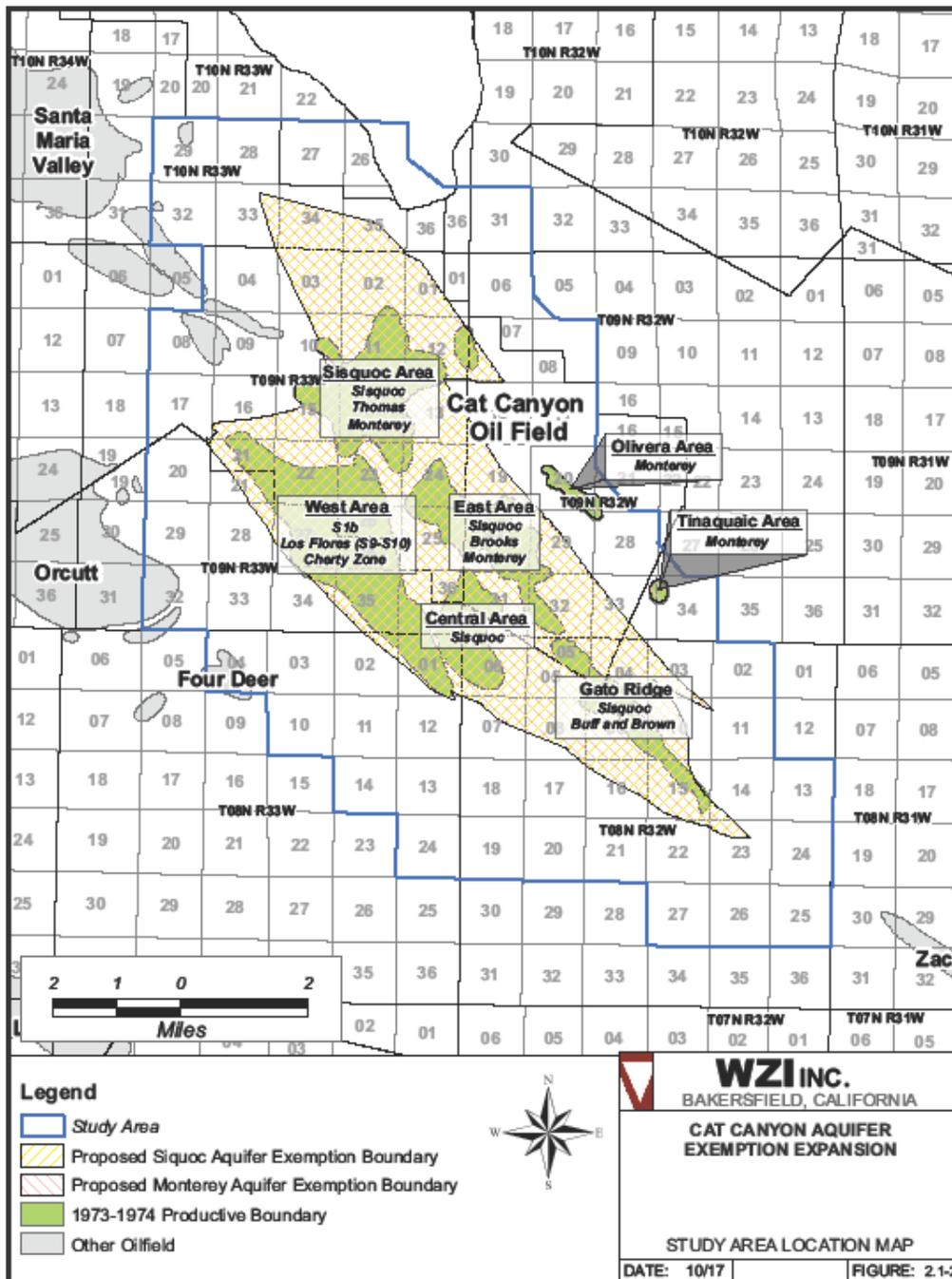


Figure 2.1-2

All Cat Canyon Oil Field Areas show consistent TDS higher than 3000 mg/L and values for boron higher than 6 mg/L in the Sisquoc Sands and Monterey Formation. The West Area has the highest area-wide average TDS and the East Area has the lowest. Sodium and Chloride ratios appear to be consistent. Sulfates appear to be consistently high (16 mg/L to 447mg/L). Analysis of the boron in the context of steaming may indicate that the boron concentration is biased high possible due to the solubility of the salts of boron (tincal, borax, pyroboric acid, etc.) in steam and hot condensate from injection into in the Sisquoc Sands, (Hawley, 1981).

2.2 Non-Cat Canyon Samples (Santa Maria Valley Oil Field)

Some of the data in the original files do not belong to wells in the actual Aquifer Exemption Expansion Area. However, the extension of the study area does encompass some of the nearby Santa Maria Valley Oil Field, **Figure 1.1-1**. These data help define the trend towards the north of the subject study area. These data are plotted along with the other final results on **Figure 2.5-1**; the chart show that the TDS increases as the production moves to the northern reaches of the subject study area. **Figure 2.2-1, Probability Plot of TDS for Analysis, Boron for Analysis**, shows the probability plot for the SMV samples. The trend toward the SMVOF area is toward higher [TDS] for both Monterey Formation ([TDS] =23,202 mg/L) and Sisquoc Sands ([TDS] = 26,675 mg/L).

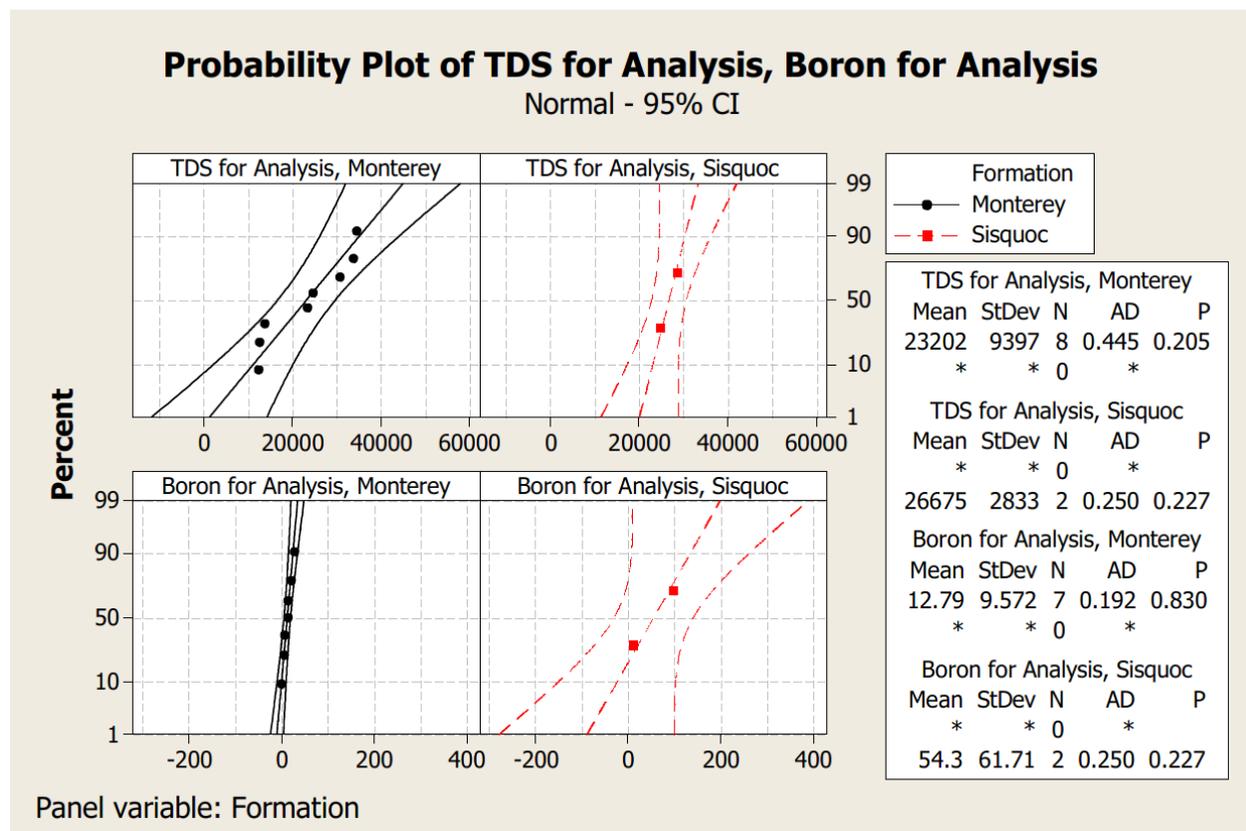


Figure 2.2-1

2.3 First Pass - Low Value Rejection

The first pass rejection focused on eliminating non-formation sources of bias particularly from samples representing upper groundwater (freshwater). These samples were examined and rejected primarily on Total Dissolved Solids by producing area and any wells with DOGGR well type designation “WS” were carefully reviewed for completion. Every consideration is given to keeping samples with lower [TDS] and [B] even if non-assigned. This is a conservative approach to force a low design [TDS] for use in the Aquifer Exemption and the Treatment Feasibility Study.

The low [TDS] samples that were clearly not marked or otherwise identified as freshwater samples were reviewed for evidence of formation dilution from groundwater sources infiltrating production well samples, (i.e. samples from wells with casing leaks may lead to “watering in” of deeper formation samples from in-rushing shallower groundwater during sampling of the deeper formation (whose formation pressure is lower than the static head of the column formed by any groundwater in the casing). No evidence of this was found, leaving the question of condensate as the most likely explanation for low [TDS] in samples from the oil producing formations. **Figure 2.3-1, Probability Plots with Area and Formation Breakdown,** shows the probability plot of the data with a breakdown by area and formation. These are examined individually in detail by area.

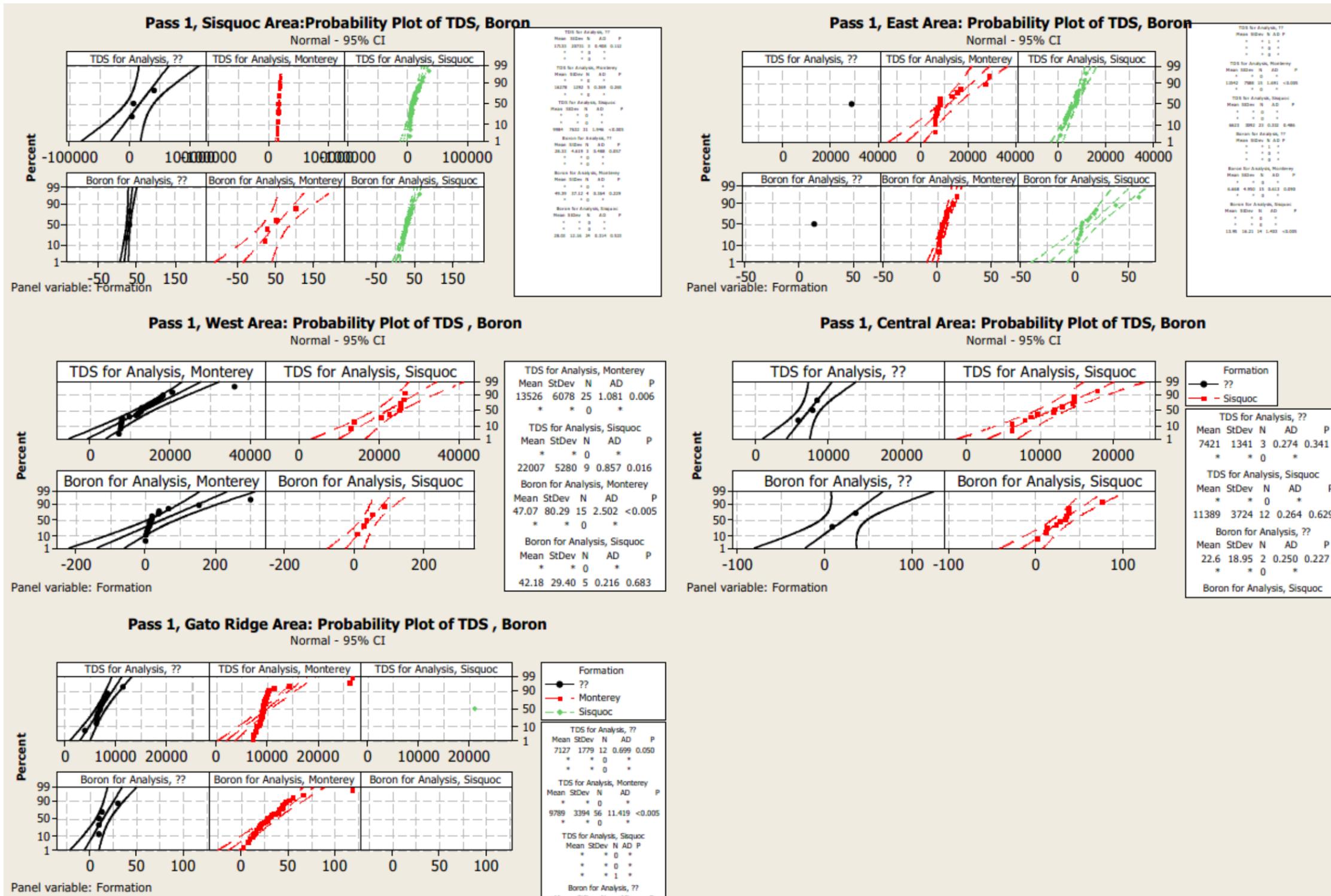


Figure 2.3-1

2.3.1 Sisquoc Area

The Sisquoc Area data reveals a heavy skew indicating that the Monterey and Sisquoc formations are distinctly different, **Figure 2.3-2, Sisquoc Area: Probability Plot of TDS, Boron**. The Monterey formation shows little skew when assessed independently whereas the Sisquoc shows a strong skew even when the two high outliers (with no formation assignment) are rejected. One low TDS sample, a water well, producing from Paso Robles formation (980mg/L), was rejected. The cluster of wells below 6400 mg/L are largely identified as “after steam” producing wells associated with the Sisquoc indicating the dilution effect of the actual formation water due to steam (blue line). This was subjected to more detailed analysis. There are 12 unassigned values, having no API number or formation information, these were not rejected but were considered until proper assignment to a formation was possible or rejection criteria are met.

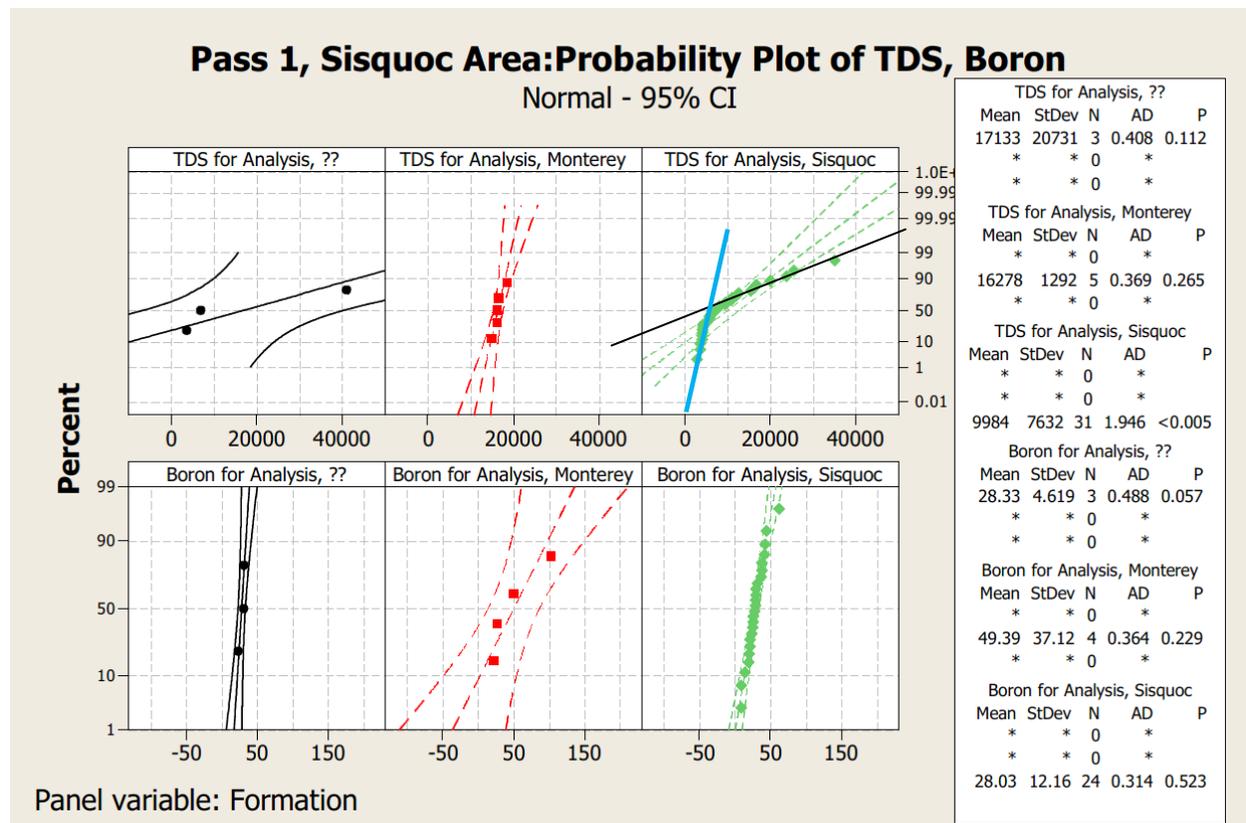


Figure 2.3-2

2.3.2 East Area

Figure 2.3-3, Pass1: East Area Probability Plot of TDS, Boron, shows the probability plots of the first pass analysis of the East Area. There is a cluster of low TDS values identified in the data set (two of which are identified as originating from fresh water wells). These wells serve the producing area in Cat Canyon Oil Field for use in steam injection operations: Brook Oil Co. (1183 mg/L), Bonetti #1 (499 mg/L), Recruit Fee FW5-25 (240 mg/L) and Recruit Fee FW6-25 (180 mg/L). These are rejected as being “Fresh Water”, not representative of the formation water. Eight values were not assigned to a formation; these were carried forward for further consideration. There were a cluster of well values near a TDS of 6000 mg/L that may be samples confounded by the dilution effect of steam or may be separated from the remainder of the formation in the East Area by a sealing fault; these values were carried forward in this pass. Two values (no well names) have formation descriptions that appear to be mislabeled; these two samples were not rejected and were addressed in later passes. There are two distinct compositional breaks in the distribution: Monterey TDS and Sisquoc boron. These may be due to faults or completions and in the case of boron, solubility of “borates” in a steaming environment.

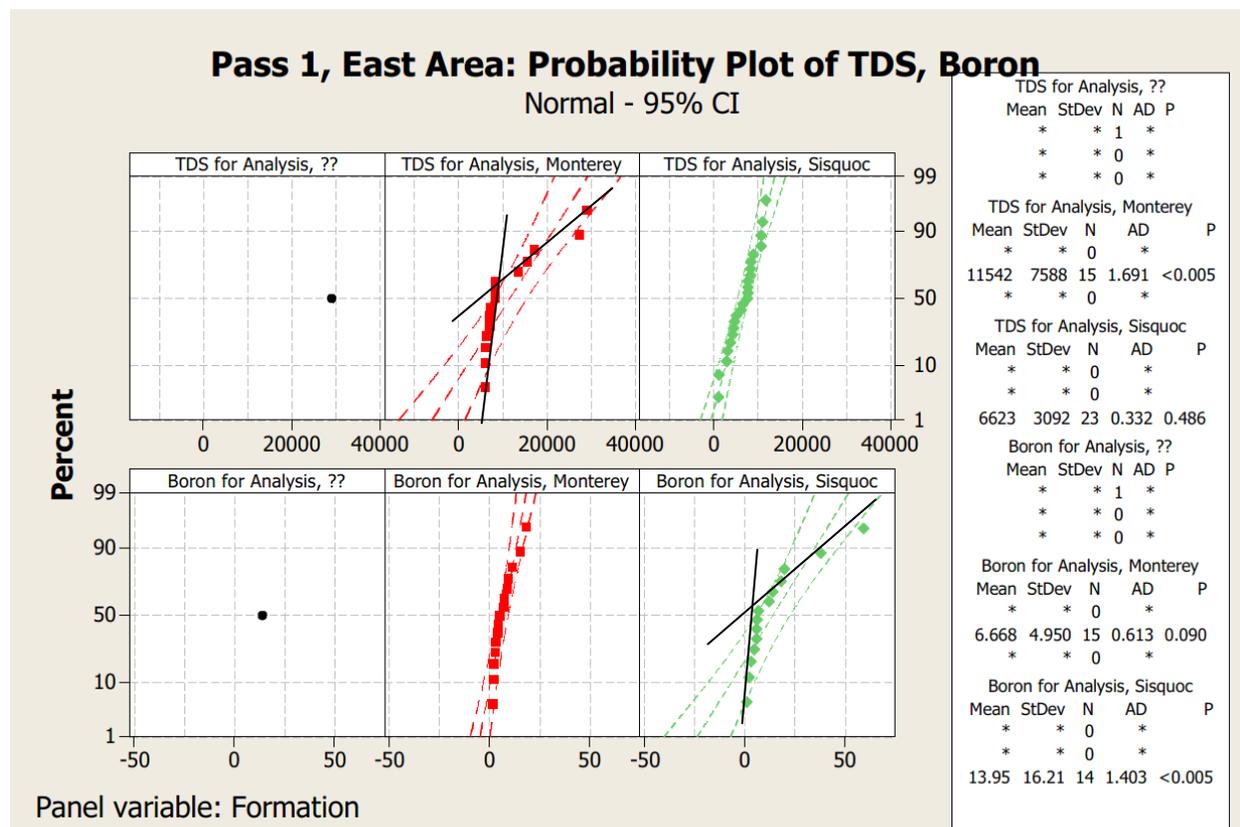


Figure 2.3-3

2.3.3 West Area

Figure 2.3-4, Pass1: West Area Probability Plot of TDS, Boron, shows the probability plots of the first pass analysis of the West Area. In the West Area there were no clusters below 3000 mg/L (a value below which a sample is considered to be from brackish drinking water sources). The data in the Monterey Formation and the Sisquoc Sands break into two distinct compositional elements (black lines); however the analysis investigated these clusters after the second pass rejecting high outliers.

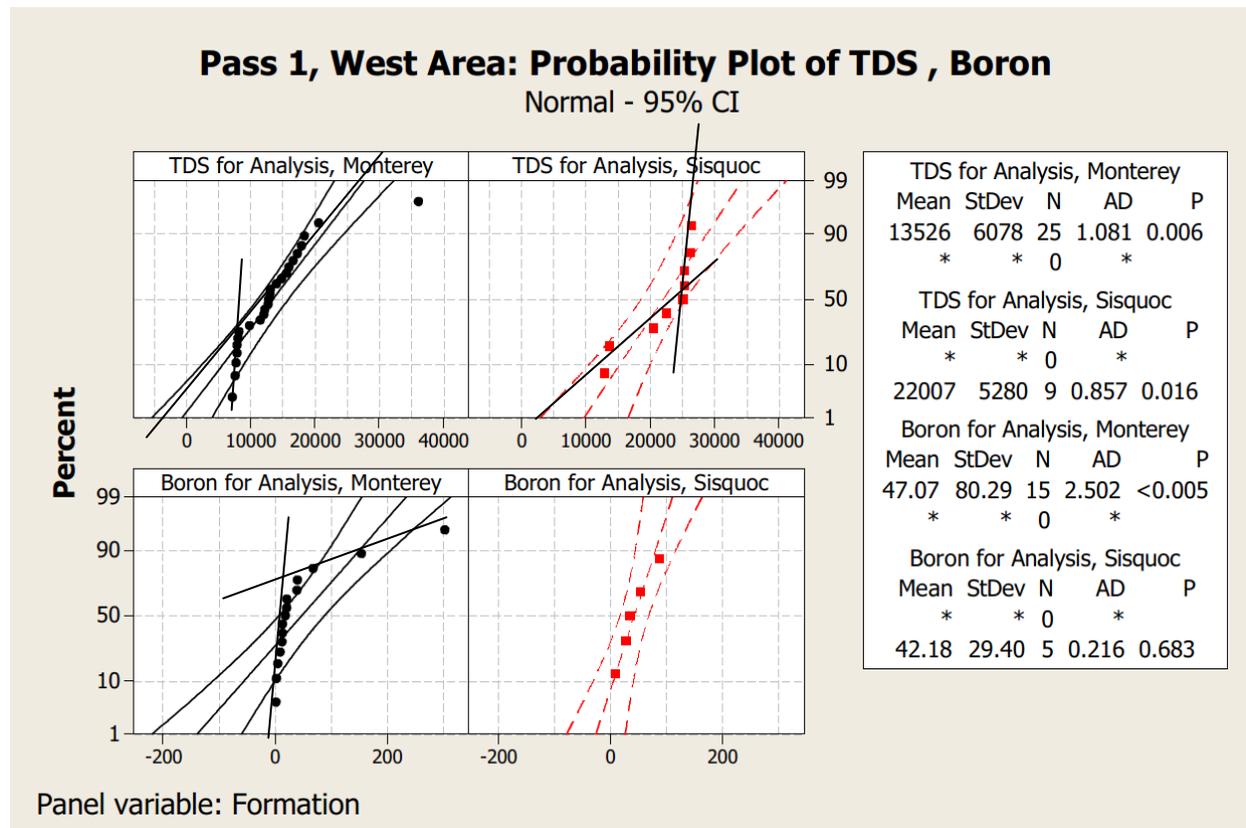


Figure 2.3-4

2.3.4 Central Area

Figure 2.3-5, Pass1: Central Area Probability Plot of TDS, Boron, shows the probability plots of the first pass analysis of the Central Area. The Central Area has one very low outlier (Fullerton Tank: [TDS] = 50 mg/L TDS) indicating either an analytical error or the water was actually treated water from a process such as Reverse Osmosis. This value was rejected.

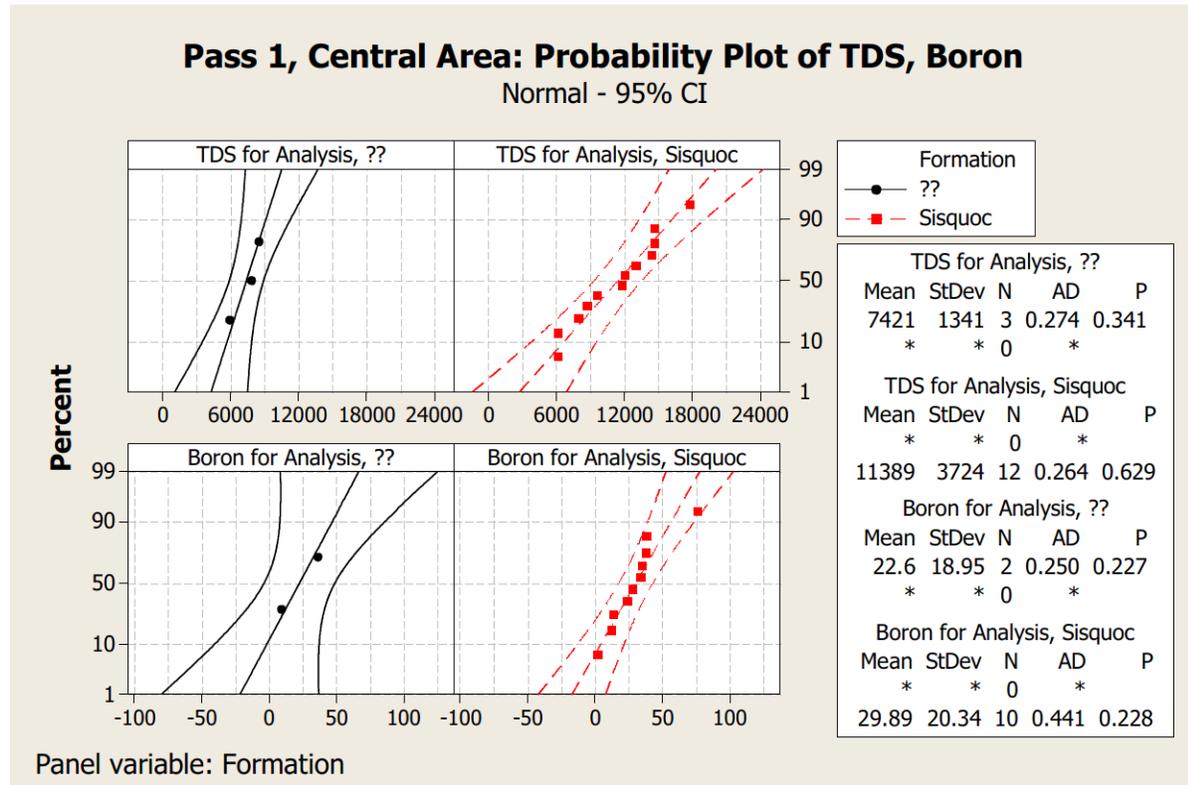


Figure 2.3-5

2.3.5 Gato Ridge Area

Figure 2.3-5, Pass1: Gato Ridge Area Probability Plot of TDS, Boron shows the probability plots of the first pass analysis of the Gato Ridge Area. One sample appeared to be an outlier based on correlation data for the Gato Ridge Area as well as its description (name): “Gato Canyon Ranch Freshwater well”, (340 mg/L). This sample was rejected. There were 15 unassigned samples, these were not rejected and were carried forward for further consideration. All unassigned samples appear to be associated with the Monterey formation. The data exhibits a certain level of skewness possibly due to: chemical treatment waste, mislabeled formation assignment, slotted completions in multiple formations, differing depths of completion or attributable to the possible presence of a sealing fault (with isolated Monterey Formation elements).

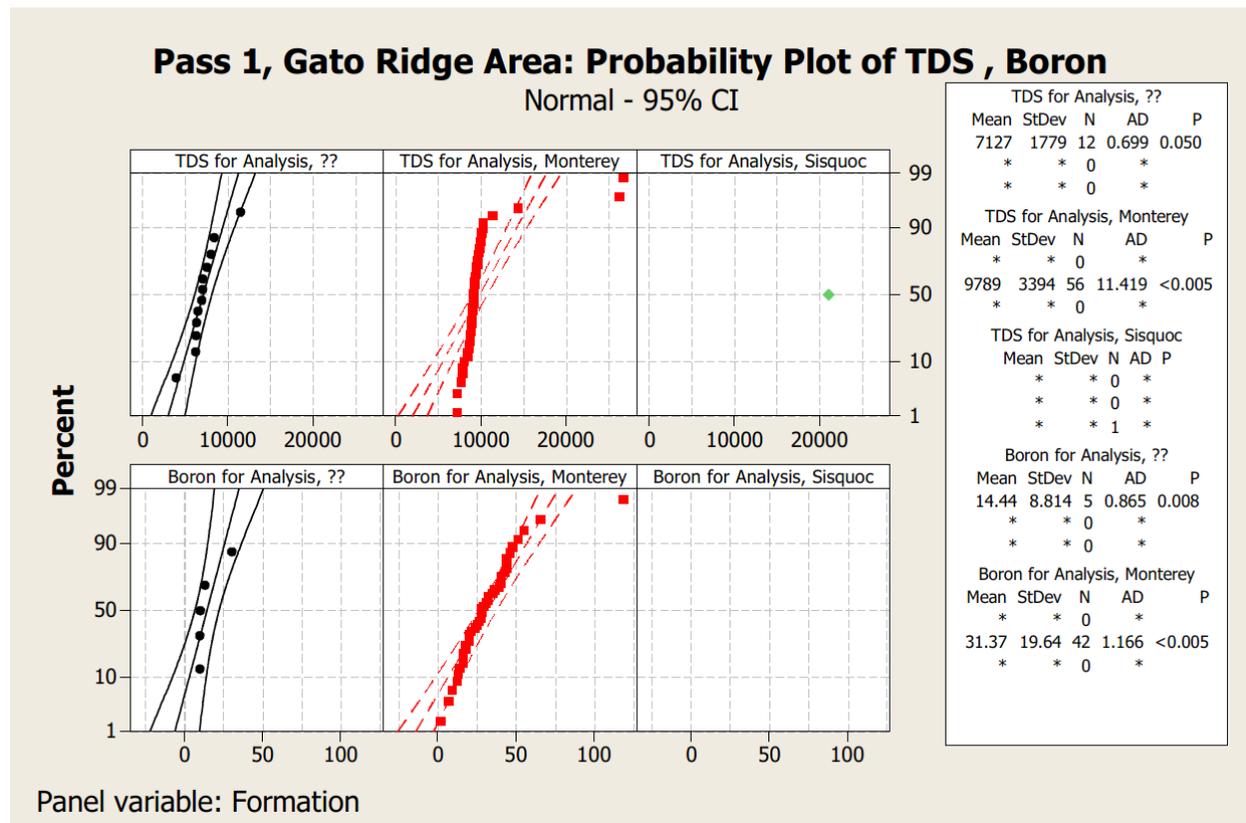


Figure 2.3-6

2.3.6 Rejected Values from First Pass

The table below summarizes the rejected values from the Pass 1 data set. There were several surviving values with [TDS] between 1000 mg/L and 3000 mg/L (potentially fresh to brackish sources) that were candidates for rejection but there was no evidence supporting their rejection at this point in the review. They were kept for later consideration. The general mean ± standard deviation allowed for consideration of some of values below 3,000 mg/L in the undifferentiated Sisquoc Sands sample cohort. However, the separation of the Sisquoc Sands samples in native formation and post steamed condensate samples and using the basic principal of maximum likelihood shifts the reasonable expectation (that data between 1000 mg/L and 3000 mg/l likely belong to condensate or groundwater sources, (Young, 1962). Other unassigned values were not rejected; they were reported as (“??”) in the summary data unless the value could be properly assigned.

Table 3.2-1: Pass 1 Low TDS Rejected Samples

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Sub-formation	TDS for Analysis	Boron for Analysis	Notes
E9b	3/1/2014		Sisquoc	Tunnel	Water Well	Fresh	Paso Robles	??	980	0.16	??
B15b		8320830	East	Recruit Fee	Recruit Fee FW5-25	WS	??		240	0.00	water source well
B15c		8321005	East	Recruit Fee	Recruit Fee FW6-25	WS	??		180	0.00	Water source well
B6	7/14/1975		East	Bonetti	Bonetti #1	WS	??		499	1.00	Water well
B7c	7/22/1965		East	??	Brooks Oil Co Well #1??	WW	??		1183		turned into WD in 1967
B9			Central	Fullerton	Fullerton Tank #2	Fresh	WS		50	0.22	water well
15	9/6/2016		Gato Ridge	Gato Canyon Ranch	Freshwater Well	WS	??		340		??

2.4 Second Pass High Value Rejection

In this pass, values were considered in the context of bias in the higher [TDS] values. Samples from sources were labeled “Waste Water”, “WW” and some “WD”. Wells labeled WD were checked to make they were not correctable to WF. These samples were considered for rejection if no evidence was found indicating the sample was representative of connate formation water.

In some instances the samples derived from wells labeled WD are samples presented to DOGGR as samples from a specific formation pursuant to a UIC Project Approval Letter (PAL) were kept. However, these samples may not have been properly sampled. These samples may not have been bailed sufficiently to ensure that no drilling fluids or other confounding sources of water are overwhelming the actual connate water.

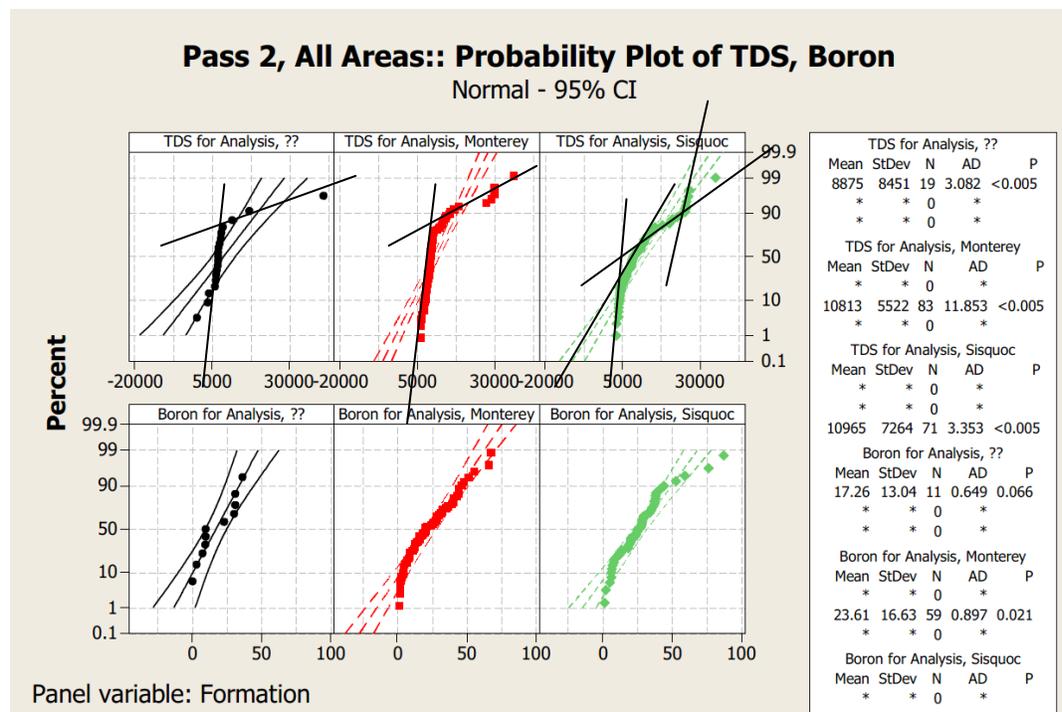


Figure 2.4-1

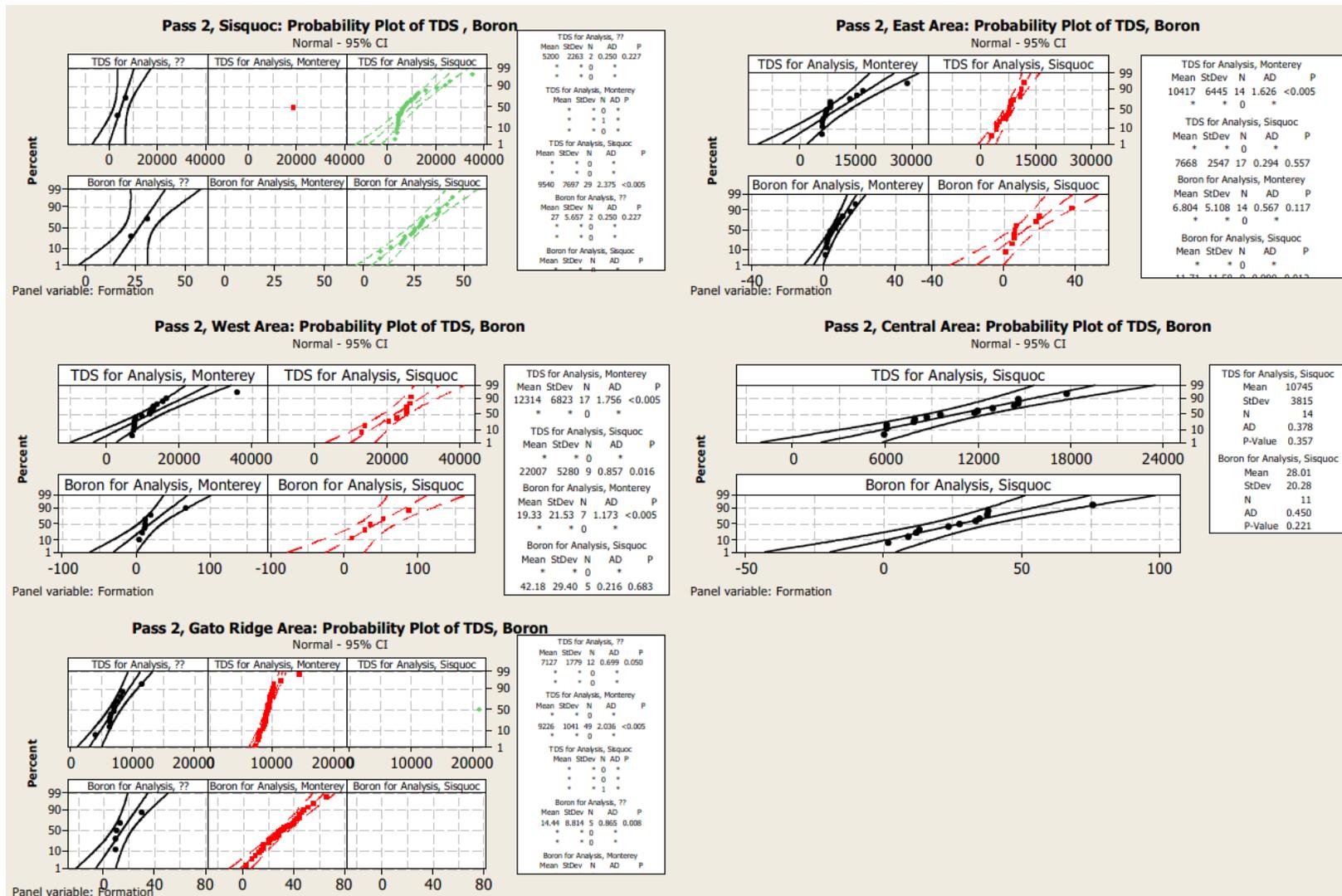


Figure 2.4-2

2.4.1 Sisquoc Area

In the Sisquoc Area the Sisquoc Sands samples exhibited some skewness. The Sisquoc Area shows the consistent residual pattern expected from the steam dilution effect in the Sisquoc Sands when samples were gathered from producing wells before the entire steam volume had been cleared from the formation or indicate that the data are grouped according to the presence of the isolated subformations in the Sisquoc Sands; the latter being less likely within a specific confined area of the Sisquoc Sands as a contiguous formation of numerous sands. Several potential composition elements exist (black lines). One high value for which no formation information was provided was rejected: Tunnel Facility ([TDS] =41,000mg/L).

A separate analysis for the Sisquoc Area, Sisquoc Sands post-steam impacts is provided later in this review; see **Section 2.5, Final Results**.

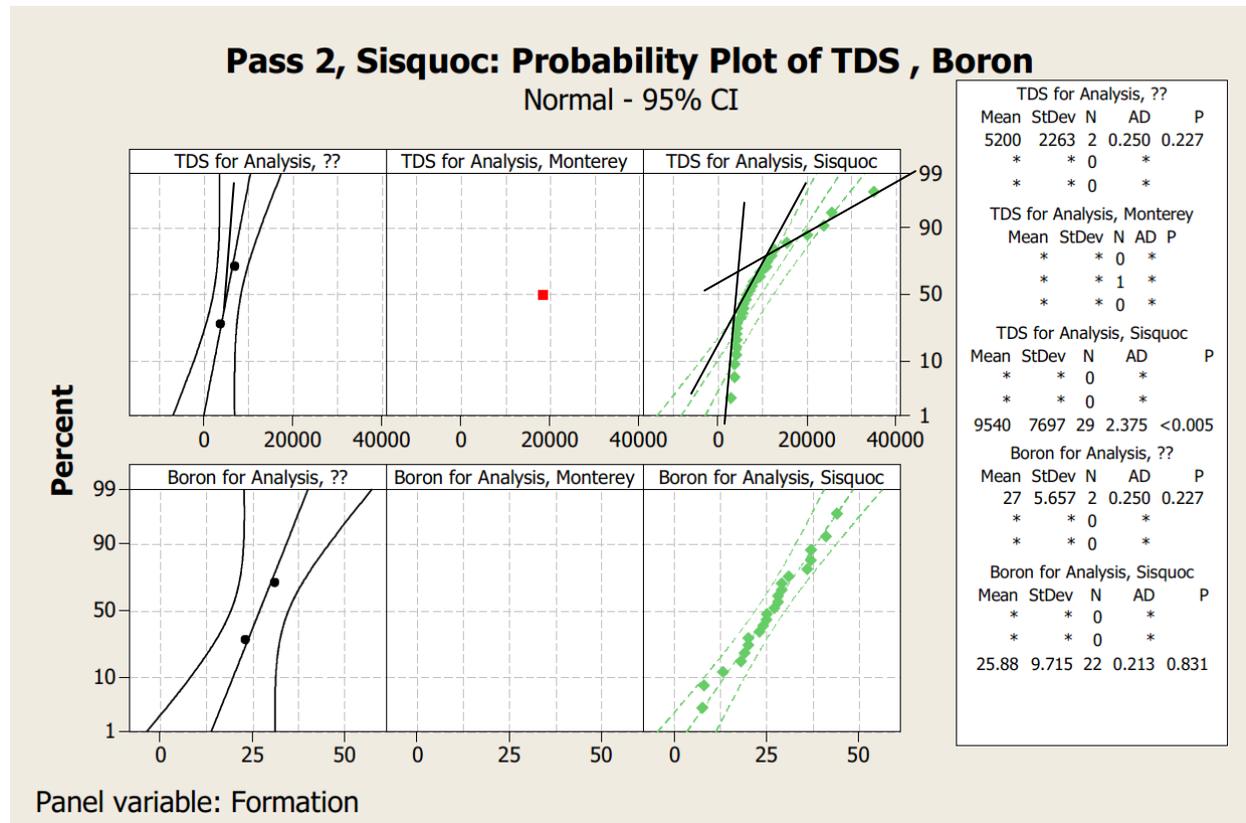


Figure 2.4-3

2.4.2 East Area

The East Area data appeared to be highly skewed in the Monterey Formation with a breakpoint at 9,000 mg/L (black lines).

Other unassigned samples appeared to be incorrectly assigned and were checked for possible reassignment to the Sisquoc formation. The remaining Sisquoc Sands data gave the false impression that the Sisquoc Sands [TDS] was lower than the Monterey formation [TDS]. While this was possible, the likely explanation is that undocumented post-steam samples were confounding the assessment, see section 2.5, **Final Results**. Nine samples were rejected: Shell Field “WW” (7,018 mg/L), Combined Area “WW” (8,232 mg/L), Field Fee “WD” (6,631 mg/L), Husky OC “WW Tank” (4,662 mg/L), Texaco “WW” (3,770 mg/L), SWEPI “WW” (3,103 mg/L), Brooks “WW” (1158 mg/L), Victory Disposal (1,041 mg/L).

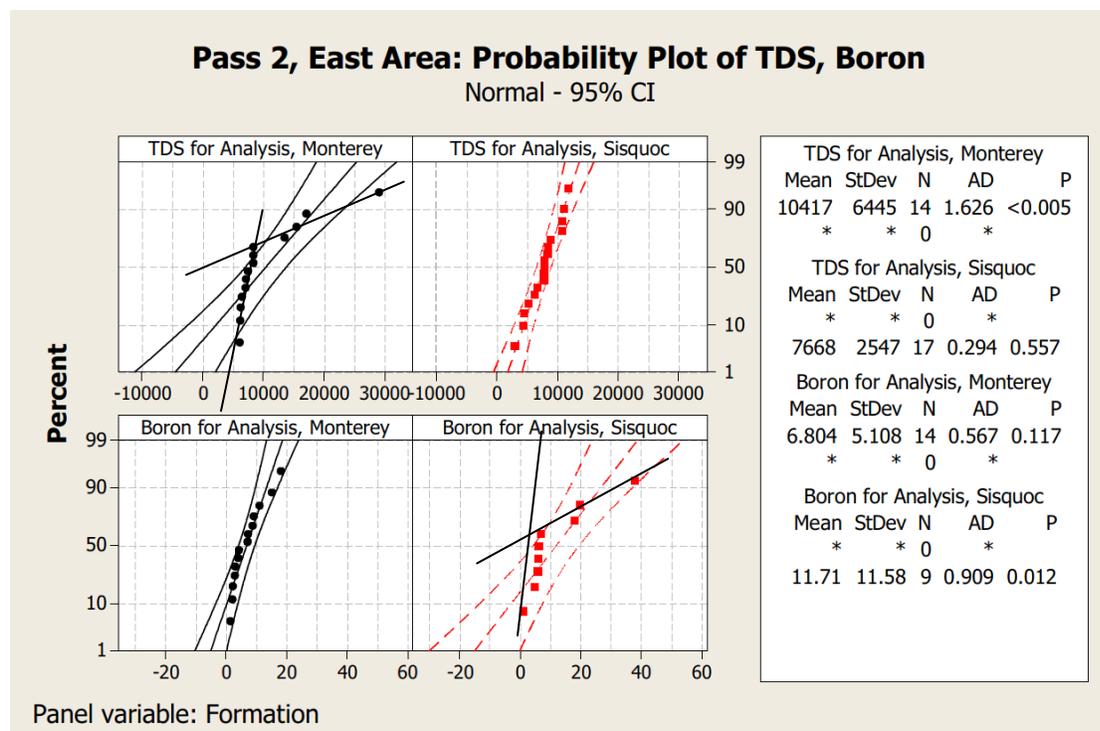


Figure 2.4-4

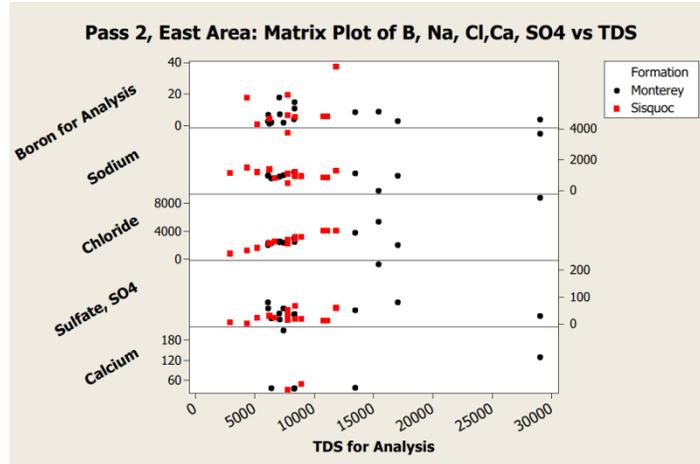


Figure 2.4-5

2.4.3 West Area

The West Area data indicated the pattern expected from a fault separation (Monterey formation samples TDS < 10,000 mg/L and TDS > 10,000 mg/L) providing potential evidence of a fault-related isolation/confinement. Several potential formation elements existed (black lines).

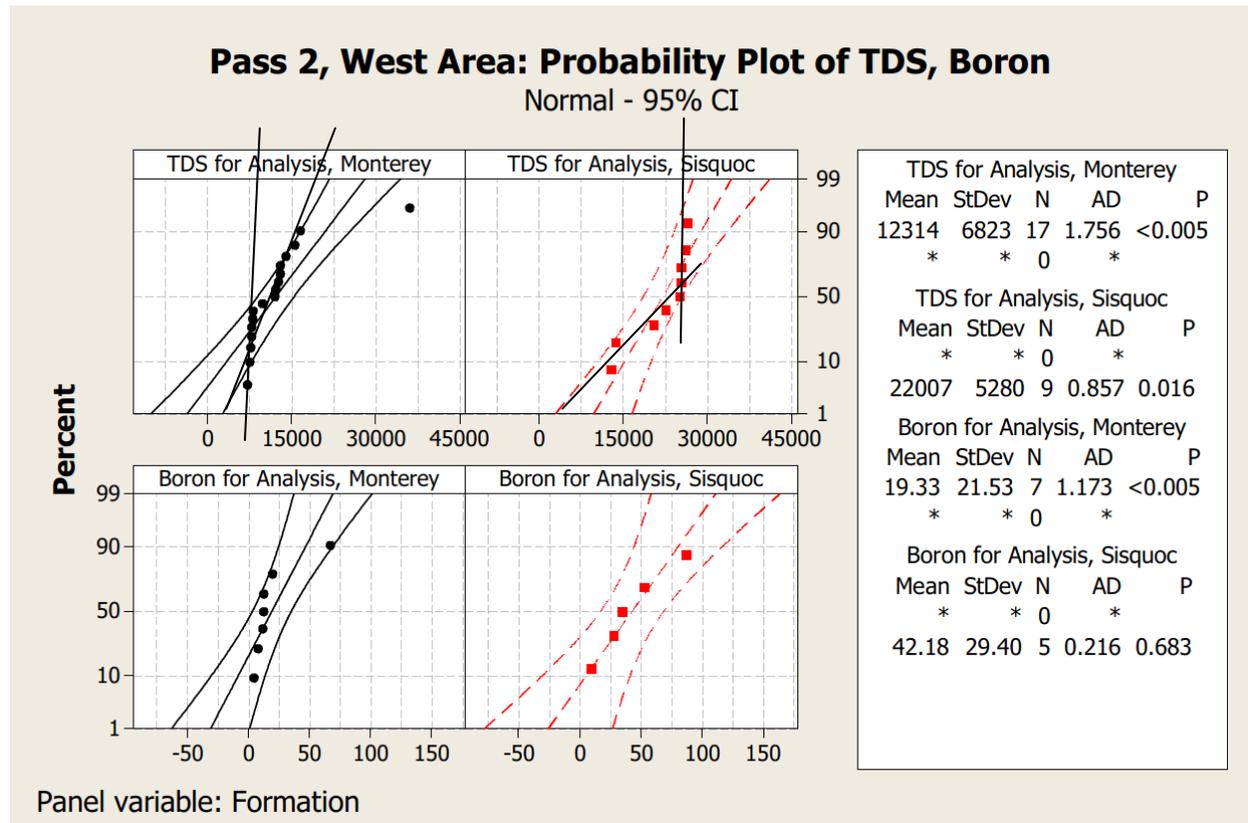


Figure 2.4-6

2.4.4 Central Area

The Sisquoc Sands water composition in the Sisquoc Area appeared to be relatively consistent from the low TDS region to the highest value recorded API No. 8300720 Los Alamos #54 (17,780 mg/L). No high data were rejected. Four unassigned samples remain, these were not rejected but as is the case in all unassigned samples they were included as such in the summary data unless the value could be properly assigned.

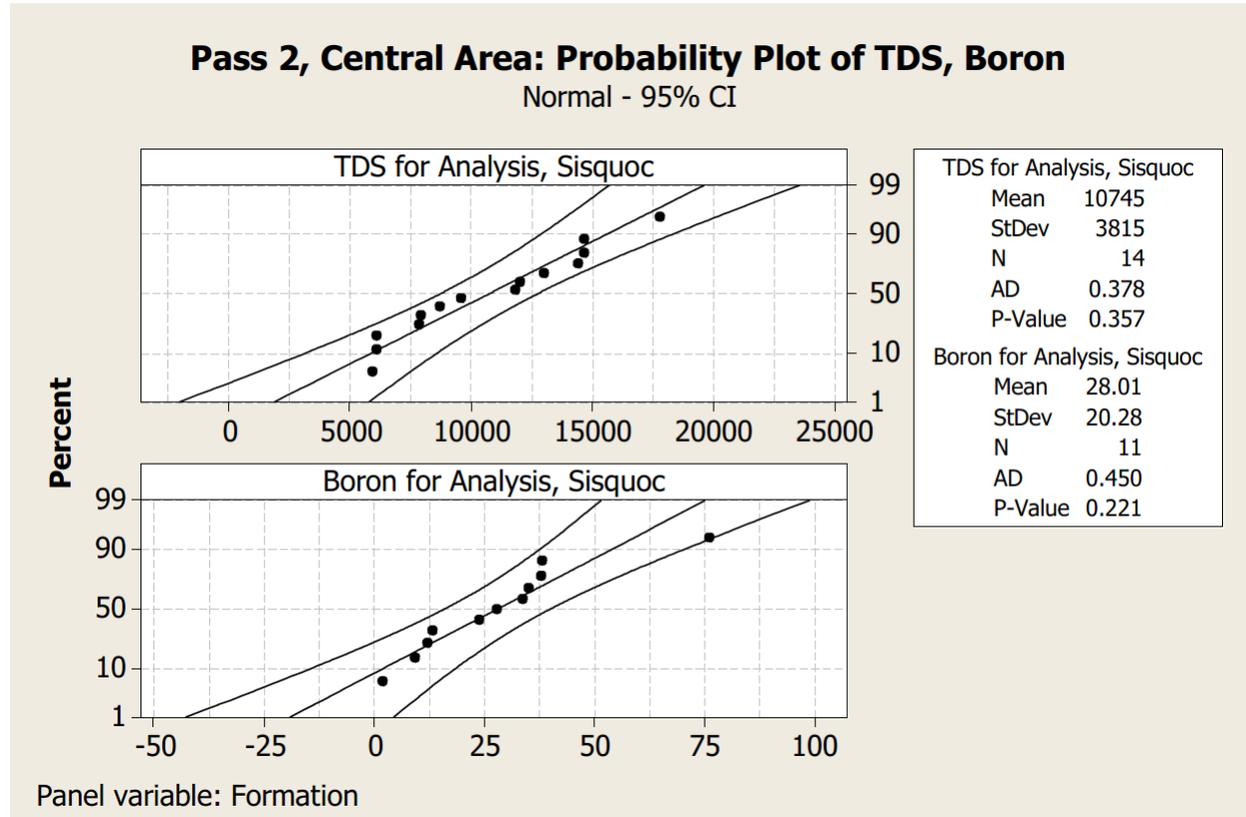


Figure 2.4-7

In the Central Area the Sisquoc Sands are steamed and water flooded therefore the lower values could be attributed to steam condensate diluting the formation water during the production cycle. Several samples showed typical random ranges of results, a review of the correlations show no inconsistencies in the formation analyses that would lead to a conclusion that the Central Area Sisquoc lower [TDS] samples were diluted. Therefore, the distribution is probably across Sisquoc sand elements that are isolated from one another by interposing silts and clays. When this was reviewed with operators, it was revealed that historically the Central Area operators had steamed and produced from the upper Sisquoc formations and reinjected the produced water into the Lower Sisquoc (S6 to S9) sands. Thus, the resultant samples leave false impression that the Central Area Sisquoc Sand native formation water is fresher than the native formation water may be. However, the purpose of the Formation Water Analysis was to simply determine appropriate water composition values for the Treatment Feasibility Study therefore the lower [TDS] values were not rejected.

2.4.5 Gato Ridge Area

Seven samples were rejected. There are two very high outliers reported for the Magenheimer lease as Tognazzini 3 or 17 ([TDS] = 26,706 mg/L and 26,225 mg/L). These values are presented as values reported in a hand written table with no supporting laboratory report. These values were rejected as not being representative of the Gato Ridge Monterey formation water composition, a review of the well history indicated that they are part of a fluorescence test conducted above the fracture pressure for which little detailed information was available. Two other values appeared to skew the Monterey formation data but were reviewed in the next section. Some of the 13 unassigned samples may be samples reflecting the multiple formation completions (Sisquoc and Monterey) due to slotted completions.

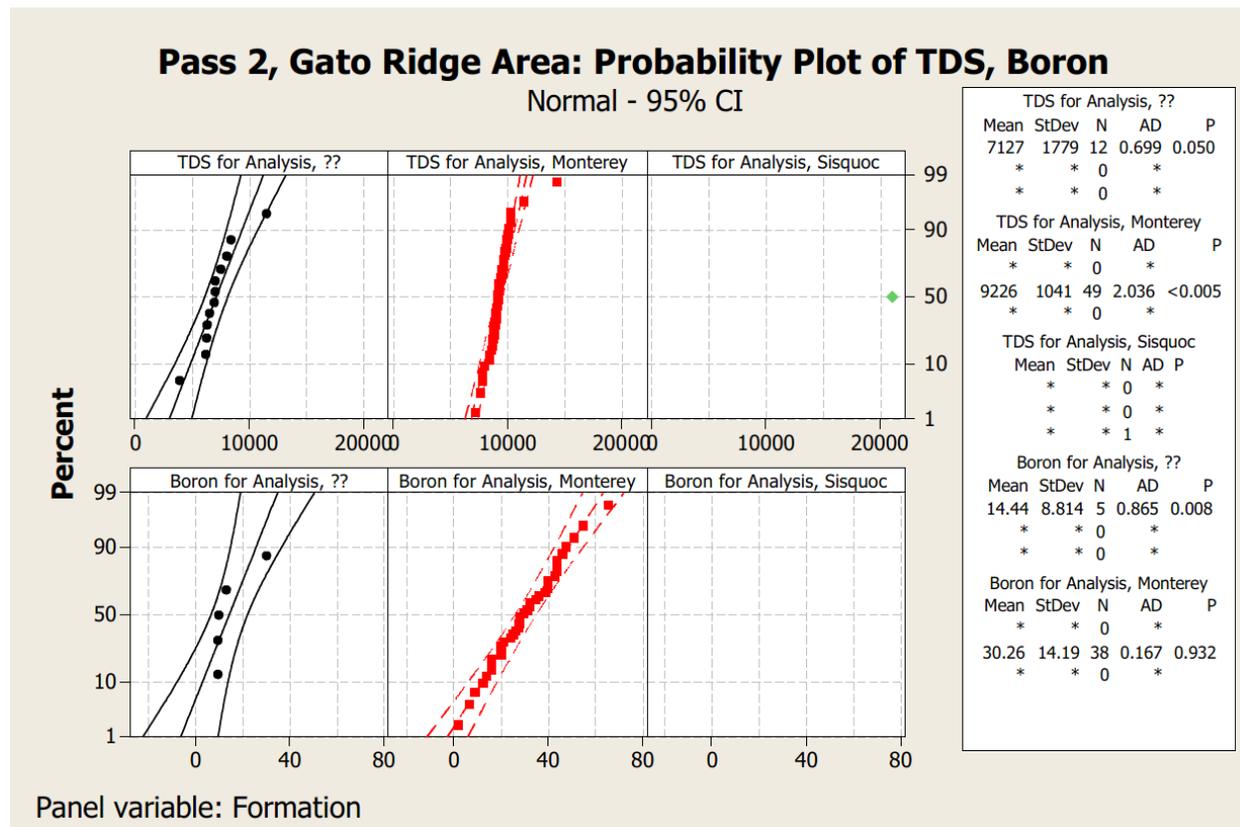


Figure 2.4-8

2.4.6 Rejected Values from Second Pass

The table below lists all values rejected in the second pass. Other unassigned values were not rejected in this pass. All unassigned samples they were reported as such (“??”) in the summary data unless the value could be properly assigned.

Table 2.4-1 Rejected Samples

Reference No	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Sub-formation	TDS for Analysis
B1c	3/11/1985	??	East	SWEPI	WW	WW	Sisquoc		3103
E11	5/2/2014	??	Sisquoc	Tunnel	Tunnel Lease T-220	Tank	Sisquoc		3600
E6	5/19/2017	8322850.00	Sisquoc	Travis	Ardantz 711	SC Well PS	??		3600
B4a	4/28/1980	??	East	Texaco except Los Alamos		WW	Sisquoc		3770
E14	3/1/2017	??	Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc		4100
E13	10/1/2016	??	Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc		4100
B1d		??	East	Husky OC	WW tnk	WW	Sisquoc		4662
E8	1/1/2013	??	Sisquoc	Tunnel	Facility	Tank	Sisquoc		5100
B7a	10/22/1971	8320043.00	East	Field Fee		WD	Sisquoc	Brooks	6631
B3	3/31/1983	??	East	Shell Field Fee	WW	WW	Monterey		7018
E74	7/29/1964	??	Gato Ridge	Tognazzini	Tognazzini waste water	WW	Monterey		7195.2
B4d-g	3/5/1990	??	East	??	Comb WW Except Los Alamos	WW	Sisquoc		8232
E33	5/18/1983	??	Gato Ridge	Tognazzini	Tognazzini waste water	WW	Monterey		8924

2.4.7 Data Corrected in Pass 2 and Carried to Pass 3

Various records, scheduled for rejection, were further reviewed against other DOGGR records and with the applicants and those records (for which satisfactory explanation were found) were updated to be included in the Final Review, Appendix II, All Surviving Data.

Table 2.4-2 Records Revised After Review and Carried into Pass 3

Reference No	Date	API Number	Area	Lease	Name/Description Well	Sample Type	Formation	Subformation	TDS for Analysis
C11	3/29/1963	8300370	Sisquoc	Porter	18	Well	Sisquoc	S8-Thomas	26100
E86	7/24/1962	8300370	Sisquoc	Porter	18	Well	Sisquoc	Basal Sisquoc	26100
E30	12/1/1983	8301400	Gato Ridge	Tognazzini	Tog 315	WD	Monterey		9660.9
E47	11/5/1976	8301455	Gato Ridge	Tognazzini	TOGNAZZINI #17 SWD	WD	Monterey		7630.43
B11b	5/5/1976	8301655	Gato Ridge	Tognazzini	Tog 43-A	WD	??		11500
B11a	7/16/1992	8301453	Gato Ridge	Tognazzini	Well 15 WW	WW	??		8390
E77	5/10/2006	8301302	West	Brooking	Brooking 54	Well	Monterey		36000
F3	10/8/1982	8321721	West	Los Alamos	LA 162	Well	Monterey		16549
E73		8301252	West	Los Flores	LOS FLORES NO. 77 - 21	Well	Monterey		15563
E23	11/30/1981	8321400	West	White	White 1	Well	Monterey		14000
E66	6/1/1974	8301427	West	Dominion/UCB	DOMINION #47	Well	Monterey		13048.96
E68	2/10/2012	8320232	West	Los Alamos	Los Alamos 156	Well	Monterey		13010
E71	6/1/1974	8320646	West	Dominion/UCB	UCB #1	Well	Monterey		12713.65
F2	12/11/1974	8320137	West	Los Alamos	LA 153	Well	Monterey		12176
F4a	1/18/1984	8321839	West	Los Alamos	LA 165	Well	Monterey		12049
E54		8301424	West	Dominion/UCB	DOMINION WELL NO 38	Well	Monterey		9828.32
E56	2/10/2012	8321719	West	Los Alamos	Los Alamos 160	Well	Monterey		8130
E60	2/10/2012	8321720	West	Los Alamos	Los Alamos 161	Well	Monterey		8030
E76		8301492	West	Bell	BELL NO. 12	Well	Monterey		7890
F1	7/7/1976	8300395	West	Los Alamos	Well 23	Well	Monterey		7880
F4b	1/18/1984	8321720	West	Los Alamos	LA 161	Well	Monterey		7714
B1e2	6/21/1966	8300662	West	R&G	0-40	Well	Monterey		7572
F4c	10/13/1983	8320232	West	Los Alamos	LA 156	Well	Monterey		7177
E111	10/22/1974	8300435	West	UCB	UCB O-12	Well	Sisquoc	S1B	26444
E103	4/20/1971	8300350	West	Los Alamos	Los Alamos 2	Well	Sisquoc	S2-S5	26153.9
E110	10/22/1974	8300012	West	UCB	UCB O-18	Well	Sisquoc	S1B	25369
C18	10/22/1974	8300012	West	UCB	0-18	Well	Sisquoc	S1b	25360
E109	10/18/1974	8300137	West	UCB	UCB O-23	Well	Sisquoc	S1B	25100
E118	4/24/1953	8301331	West	Alexander	Alexander 154	Well	Sisquoc	S6	22543.9
E93	7/17/1972	8301509	West	Bell	Bell 39	Well	Sisquoc	S2-S6A	20461
E92	3/12/1980	8300381	West	Los Alamos	Los Alamos 1	Well	Sisquoc	S2-S5	13730
E94	6/12/2012	8322760	West	Los Alamos	Los Alamos 325	Well	Sisquoc	S6-S9	12903
B18a	4/20/1971	8300313	Central	Los Alamos	Los Alamos #31	WF	Sisquoc		7929
B5b	3/4/1966	8300313	Central	Los Alamos	Los Alamos 31	WF	Sisquoc		7844
I1	8/1/2014	8322656	Sisquoc	Tunnell	Tunnell S-2	SC Well PS	Sisquoc	Upper Sisquoc	3200.00
I2	6/1/2017	8322666	Sisquoc	Tunnell	Tunnell S-17	SC Well PS	Sisquoc	Upper Sisquoc	3600.00
I3	6/1/2017	8322885	Sisquoc	Ardantz	Ardantz 511	SC Well PS	Sisquoc	Upper Sisquoc	5400.00
I4	10/13/2016	8322871	Sisquoc	Travis	Travis 1WD	Well	Sisquoc	Upper Sisquoc	9400.00
I5	5/12/2017	8322869	Sisquoc	Ardantz	Ardantz 506	SC Well PS	Sisquoc	Upper Sisquoc	9500.00
I6	6/1/2017	8322869	Sisquoc	Ardantz	Ardantz 506	SC Well PS	Sisquoc	Upper Sisquoc	11000.00
I7	11/27/2013	8322599	Sisquoc	Travis	Travis 201	Well	Sisquoc	Upper Sisquoc	12000.00

2.5 Final Results

For the final review, all unattributed data were reviewed and rejected in the absence of reliable formation reference; wells showing evidence of facility treatment were rejected as potentially carrying brine from water softeners as well as other reject from water treatment equipment.

In a separate analysis, steaming wells (SC) and associated tankage were separately assessed to establish the near well radius effects due to steaming dilution. Native formation water composition was determined by looking only at wells (OG and SC) that are not identified as Post Steaming during steam/production cycles. Sub-formation elements of the Sisquoc and fault impact elements were separated and assessed.

A review of the surviving samples against the DOGGR 2016 Data Base for Oil and Gas Wells shows that samples were populated by wells that are Cyclic Steam Injection (SC) wells. Most were in the Central and East Area and completed in the Sisquoc formation.

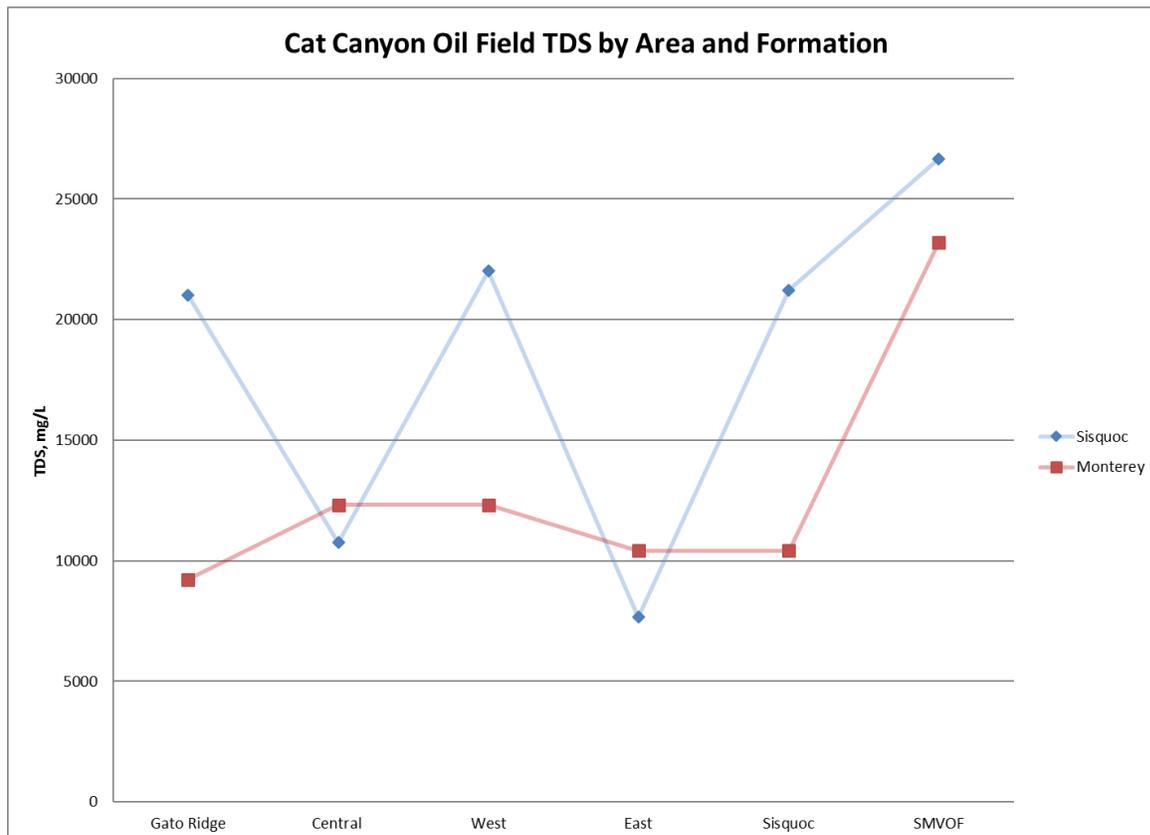


Figure 2.5-1

2.5.1 Sisquoc Area

Data from the Siquoc Area, Sisquoc Sands contained a unique set of well documented samples that allow assessment of the impact of steam injection of the determination of formation water. **Figure 2.5-2**, Probability Plots of the Sisquoc Area continued to show the pattern presumed to be due to steaming related dilution of formation samples. This was particularly

evident in the skewed Sisquoc formation samples, possibly reflected in the nine unassigned values as well (however, these values were rejected if not assignable to a formation). Boron did not show the characteristic skew found in the TDS, Sodium and Chloride probability plots. The steaming effect on borates appeared to be in proportion to the amount of steaming that takes place at a specific well.

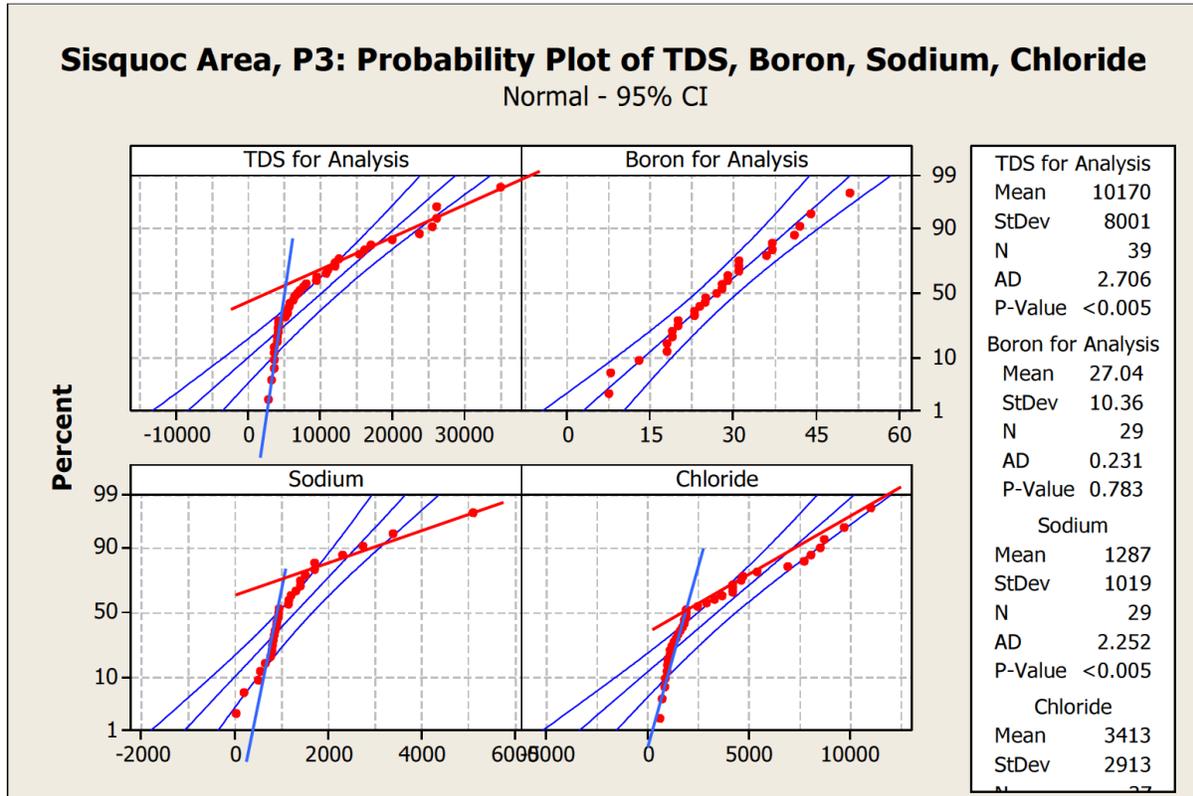


Figure 2.5-2

Table 2.5.1-1 Pass 3: All Sisquoc Area Data

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
E84	2/11/1985	8320423	Sisquoc	United California	United California 51	SC Well PS	Sisquoc	S1B	12550.00	27.98
E119	1/16/1985	8321106	Sisquoc	Harbordt	Harbordt 3-16	SC Well PS	Sisquoc	Basal Sisquoc	10786.00	24.90
E98	12/12/2013	8300710	Sisquoc	GWP	GWP 11-13	SC Well PS	Sisquoc	Basal Sisquoc	7980.00	7.56
E99	12/12/2013	8321860	Sisquoc	Cantin	Cantin 40	SC Well PS	Sisquoc	Basal Sisquoc	7610.00	7.84
G7	6/8/2017	8322599	Sisquoc	Travis	Travis 201	SC Well PS	Sisquoc	S2-S8	6400.00	37.00
G8	6/8/2017	8322819	Sisquoc	Travis	Travis 203	SC Well PS	Sisquoc	S9	6200.00	44.00
G2	6/8/2017	8322599	Sisquoc	Travis	Travis 201	SC Well PS	Sisquoc	S2-S8	5700.00	41.00
E108	2/6/1975	8320393	Sisquoc	Tunnell	Tunnell 15	SC Well PS	Sisquoc	Basal Sisquoc	5683.70	*
G6	6/8/2017	8322662	Sisquoc	Tunnell	Tunnell S11	SC Well PS	Sisquoc	S8 / S9	5400.00	31.00
E8	1/1/2013		Sisquoc	Tunnel	Facility	Tank	Sisquoc	??	5100.00	25.00
E10a	5/1/2014		Sisquoc	Tunnel	All Tunnel Wells	Tank	Sisquoc	??	4200.00	23.00
G3	6/8/2017	8322657	Sisquoc	Tunnell	Tunnell S3	SC Well PS	Sisquoc	S1b / S2	4200.00	20.00
E14	3/1/2017		Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc	??	4100.00	28.00
E13	10/1/2016		Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc	??	4100.00	27.00
E12	11/3/2015		Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc	??	4000.00	29.00
E10b	5/1/2014		Sisquoc	Tunnel	Tunnel Lease T-210	Tank	Sisquoc	??	4000.00	24.00
E11	5/2/2014		Sisquoc	Tunnel	Tunnel Lease T-220	Tank	Sisquoc	??	3600.00	20.00
G4	6/8/2017	8322666	Sisquoc	Tunnell	Tunnell S17	SC Well PS	Sisquoc	S1b / S2/ s9	3600.00	18.00
E4	7/1/2014	8322656	Sisquoc	Tunnel	S-2 Post Steam	SC Well PS	Sisquoc	S2	2800.00	19.00
E9	3/1/2014		Sisquoc	Tunnel	All wells Produced Water year2	SC Well PS	Sisquoc	??	6800.00	31.00
E6	5/19/2017	8322850	Sisquoc	Travis	Ardantz 711	SC Well PS	Sisquoc	??	3600.00	23.00
E107	2/6/1975	8320368	Sisquoc	Cantin (Recruit??)	Cantin 24 (21-25??)	SC Well PS	Sisquoc	Basal Sisquoc	7153.30	*
E2	4/1/2012	8322602	Sisquoc	Tunnel	S-10	SC Well	Sisquoc	S8/S9	35000.00	13.00
E85	2/3/1970	8320222	Sisquoc	Security Fee	Security Fee 1	Well	Sisquoc	Thomas/Basal Sisquoc	25495.00	*
E120	10/31/1975	8320792	Sisquoc	Mortensen	Mortensen 14-6	SC Well	Sisquoc	Thomas/Basal Sisquoc	23705.00	*
E87	4/26/1982	8321702	Sisquoc	Hunter Resources	HR-OPI 13-17	Well	Sisquoc	Basal Sisquoc	19995.00	*
C14	4/26/1982	8321702	Sisquoc	HR-OPI	HR OPI 13-7	Well	Sisquoc	S9	15400.00	*
E3	11/23/2013	8322599	Sisquoc	Travis	Travis 201	Well	Sisquoc	S2-S8	12000.00	*
C11	3/29/1963	8300370	Sisquoc	Porter	18	Well	Sisquoc	S8-Thomas	26100.00	*
E86	7/24/1962	8300370	Sisquoc	Porter	18	Well	Sisquoc	Basal Sisquoc	26100.00	*
E116	12/1/1980	8321465	Sisquoc	GWP	GWP WD2-13	WD	Sisquoc	S1B-S5	16153.00	19.00
I1	8/1/2014	8322656	Sisquoc	Tunnell	Tunnell S-2	SC Well PS	Sisquoc	Upper Sisquoc	3200.00	18.00
I2	6/1/2017	8322666	Sisquoc	Tunnell	Tunnell S-17	SC Well PS	Sisquoc	Upper Sisquoc	3600.00	31.00
I3	6/1/2017	8322885	Sisquoc	Ardantz	Ardantz S11	SC Well PS	Sisquoc	Upper Sisquoc	5400.00	29.00
I4	10/13/2016	8322871	Sisquoc	Travis	Travis 1WD	Well	Sisquoc	Upper Sisquoc	9400.00	36.00
I5	5/12/2017	8322869	Sisquoc	Ardantz	Ardantz 506	SC Well PS	Sisquoc	Upper Sisquoc	9500.00	37.00
I6	6/1/2017	8322869	Sisquoc	Ardantz	Ardantz 506	SC Well PS	Sisquoc	Upper Sisquoc	11000.00	*
I7	11/27/2013	8322599	Sisquoc	Travis	Travis 201	Well	Sisquoc	Upper Sisquoc	12000.00	41.97
J1	5/31/2017	8321524.00	Sisquoc	GWP	GWP 738	Well	Sisquoc	S1b	17000.00	51.00

“Well” and the two values for “SC Wells” (red highlight). The lower values for “Well” are likely associated with the condensate skewed samples “SC Wells PS”. GWP WD2-13 (a sample taken after 500 bbl were bailed) is probably a connate sample (29,353 mg/L) partially confounded by the remnants of produced water (“SC Well PS” [TDS] = 6,146 mg/L) that was likely provided by the operator to the driller for drilling fluids. This underscores the importance of more extensive bailing when regulatory actions and related decisions may be driven by faulty sampling of post drilling fluid in well bores.

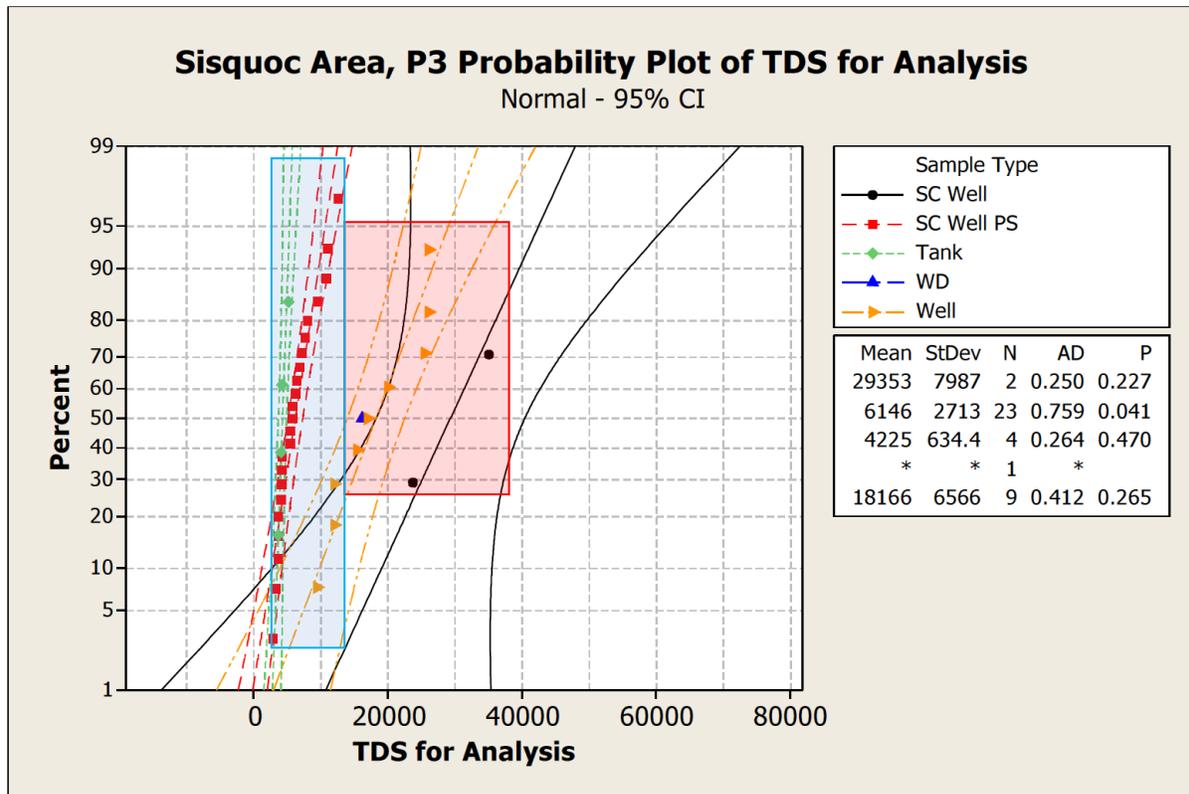


Figure 2.5-4

2.5.1.1 Sisquoc Sands Steaming Effect

The separation according to post-steaming status of the Sisquoc Area Sisquoc Sands samples is shown in more detail below. The results indicate that Canyon Oil Field Sisquoc Sands sample data may consistently understate the formation composition by some degree of dilution.

The data indicate that samples below 10,000mg/L are likely diluted by the active steaming in the Sisquoc Sands in the Sisquoc Area. A review of the source data for the surviving Sisquoc Area Sisquoc Sands samples with [TDS]< 12,000 mg/L are identified in Vaquero files as being related to steam injection operations. **Table 2.5.1-2** shows those surviving samples that show evidence of being confounded by the produced condensate effect which dilutes the true formation TDS composition in the Sisquoc Sands.

Table 2.5.1-2 Sisquoc Area, Sisquoc Sands Samples affected by returning Produced Steam Condensate

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
E84	2/11/1985	8320423	Sisquoc	United California	United California 51	SC Well PS	Sisquoc	S1B	12550.00	27.98
E119	1/16/1985	8321106	Sisquoc	Harbordt	Harbordt 3-16	SC Well PS	Sisquoc	Basal Sisquoc	10786.00	24.90
E98	12/12/2013	8300710	Sisquoc	GWP	GWP 11-13	SC Well PS	Sisquoc	Basal Sisquoc	7980.00	7.56
E99	12/12/2013	8321860	Sisquoc	Cantin	Cantin 40	SC Well PS	Sisquoc	Basal Sisquoc	7610.00	7.84
G7	6/8/2017	8322599	Sisquoc	Travis	Travis 201	SC Well PS	Sisquoc	S2-S8	6400.00	37.00
G8	6/8/2017	8322819	Sisquoc	Travis	Travis 203	SC Well PS	Sisquoc	S9	6200.00	44.00
G2	6/8/2017	8322599	Sisquoc	Travis	Travis 201	SC Well PS	Sisquoc	S2-S8	5700.00	41.00
E108	2/6/1975	8320393	Sisquoc	Tunnell	Tunnell 15	SC Well PS	Sisquoc	Basal Sisquoc	5683.70	
G6	6/8/2017	8322662	Sisquoc	Tunnell	Tunnell S11	SC Well PS	Sisquoc	S8 / S9	5400.00	31.00
E8	1/1/2013		Sisquoc	Tunnel	Facility	Tank	Sisquoc	??	5100.00	25.00
E10a	5/1/2014		Sisquoc	Tunnel	All Tunnel Wells	Tank	Sisquoc	??	4200.00	23.00
G3	6/8/2017	8322657	Sisquoc	Tunnell	Tunnell S3	SC Well PS	Sisquoc	S1b / S2	4200.00	20.00
E14	3/1/2017		Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc	??	4100.00	28.00
E13	10/1/2016		Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc	??	4100.00	27.00
E12	11/3/2015		Sisquoc	Tunnel	Produced Garey Area Wells	SC Well PS	Sisquoc	??	4000.00	29.00
E10b	5/1/2014		Sisquoc	Tunnel	Tunnel Lease T-210	Tank	Sisquoc	??	4000.00	24.00
E11	5/2/2014		Sisquoc	Tunnel	Tunnel Lease T-220	Tank	Sisquoc	??	3600.00	20.00
G4	6/8/2017	8322666	Sisquoc	Tunnell	Tunnell S17	SC Well PS	Sisquoc	S1b / S2/ s9	3600.00	18.00
E4	7/1/2014	8322656	Sisquoc	Tunnel	S-2 Post Steam	SC Well PS	Sisquoc	S2	2800.00	19.00
E9	3/1/2014		Sisquoc	Tunnel	All wells Produced Water year2	SC Well PS	Sisquoc	??	6800.00	31.00
E6	5/19/2017	8322850	Sisquoc	Travis	Ardantz 711	SC Well PS	Sisquoc	??	3600.00	23.00
E107	2/6/1975	8320368	Sisquoc	Cantin (Recruit??)	Cantin 24 (21-25??)	SC Well PS	Sisquoc	Basal Sisquoc	7153.30	
I1	8/1/2014	8322656	Sisquoc	Tunnell	Tunnell S-2	SC Well PS	Sisquoc	Upper Sisquoc	3200.00	19.00
I2	6/1/2017	8322666	Sisquoc	Tunnell	Tunnell S-17	SC Well PS	Sisquoc	Upper Sisquoc	3600.00	18.00
I3	6/1/2017	8322885	Sisquoc	Ardantz	Ardantz 511	SC Well PS	Sisquoc	Upper Sisquoc	5400.00	31.00
I5	5/12/2017	8322869	Sisquoc	Ardantz	Ardantz 506	SC Well PS	Sisquoc	Upper Sisquoc	9500.00	36.00
I6	6/1/2017	8322869	Sisquoc	Ardantz	Ardantz 506	SC Well PS	Sisquoc	Upper Sisquoc	11000.00	37.00

Table 2.5.1-3 shows the samples that trend to, or represent, the actual native formation water composition of the Sisquoc Sands in the Sisquoc Area. These waters would be the water actually produced by a community service well, were it able to produce sufficient water.

Table 2.5.1-3 Sisquoc Area, Sisquoc Formation Samples Not affected by Steam Condensate										
Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
E2	4/1/2012	8322602	Sisquoc	Tunnel	S-10	SC Well	Sisquoc	S8/S9	35000.00	13.00
E85	2/3/1970	8320222	Sisquoc	Security Fee	Security Fee 1	Well	Sisquoc	Thomas/Basal Sisquoc	25495.00	
E120	10/31/1975	8320792	Sisquoc	Mortensen	Mortensen 14-6	SC Well	Sisquoc	Thomas/Basal Sisquoc	23705.00	
E87	4/26/1982	8321702	Sisquoc	Hunter Resources	HR-OPI 13-17	Well	Sisquoc	Basal Sisquoc	19995.00	
C14	4/26/1982	8321702	Sisquoc	HR-OPI	HR OPI 13-7	Well	Sisquoc	S9	15400.00	
E3	11/23/2013	8322599	Sisquoc	Travis	Travis 201	Well	Sisquoc	S2-S8	12000.00	
C11	3/29/1963	8300370	Sisquoc	Porter	18	Well	Sisquoc	S8-Thomas	26100.00	
E86	7/24/1962	8300370	Sisquoc	Porter	18	Well	Sisquoc	Basal Sisquoc	26100.00	
E116	12/1/1980	8321465	Sisquoc	GWP	GWP WD2-13	WD	Sisquoc	S1B-S5	16153.00	41.97
I4	10/13/2016	8322871	Sisquoc		Travis 1WD	Well	Sisquoc	Upper Sisquoc	9400.00	29.00
I7	11/27/2013	8322599	Sisquoc		Travis 201	Well	Sisquoc	Upper Sisquoc	12000.00	
J1	5/31/2017	8321524	Sisquoc	GWP	GWP 738	Well	Sisquoc	S1b	17000.00	51.00

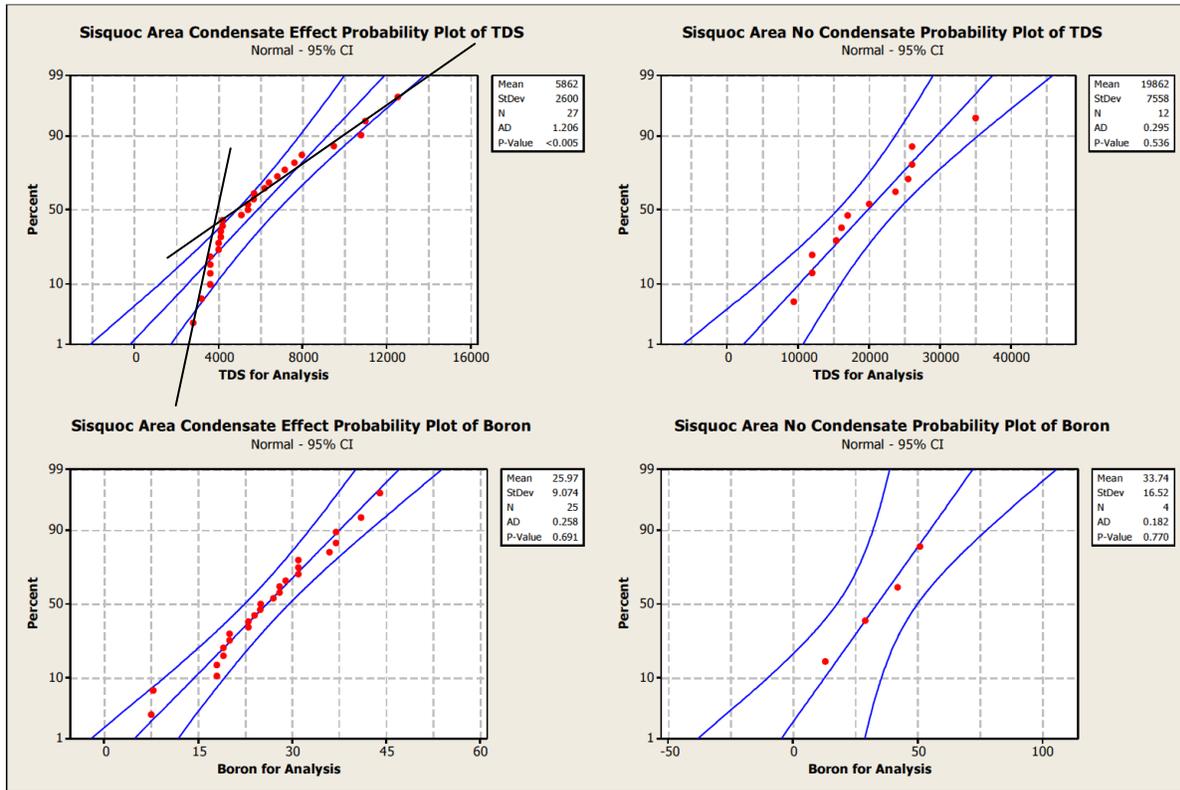


Figure 2.5-5

Data review indicated that steam injection may cause a 4:1 sample dilution bias (skewed to lower values) due to dilution of the formation water during production cycles. In the case of the Sisquoc Area where some Sisquoc Sands samples were well defined (as to post steam injection status) the average formation composition could randomly range around the all-in mean: from the (low end condensate driven value up to the no condensate mean). However, there is also a clear breakpoint in the condensate affected samples at about 4,100 mg/L. The [TDS] data below this point are probably associated with samples containing large volume of non-Sisquoc Sands water being introduced into the cycle. Whereas the [TDS] data above 4,100 mg/L are representative of samples that in various stages of mixing with condensate. The historic data were not gathered with this intent and most of the formation water quality analysis does not allow one to assign each sample to its individual circumstances (volumes of fluids produced since injection, time since injection, [TDS] of injectate, etc.)

For the purpose of Treatment Feasibility one must note that the facilities and wells from which these data were gathered are DOGGR regulated facilities and wells that would be abandoned according to state code. New wells for the drinking water project would likely be drilled into formations with area-wide historic oil production and completed in formation space that has not necessarily been subjected to the influence of steaming (unless drilled close to an abandoned cyclic well that was aggressively steamed and then promptly abandoned. Any wells that are in proximity to past steaming can only recover the near radius capture of any lingering steam condensate from the nearby (now abandoned wells). Thus, the yield of water would be that of connate water over the life of the water production project. The average producing well

in Cat Canyon Oil Field has been 2.9 gallons per minute for the past 5 years. Refer to Section 5, Aquifer Exemption Expansion Application Study.

2.5.2 East Area

The East Area showed some skewness in the Monterey formation, breaking at approximately 8,300 mg/L; however the Sisquoc formation showed consistent distribution. The two Field Fee samples: one, identified as “Brooks and Monterey”, was rejected (as a waste water sample) and the other, a record showing Monterey Miocene, is reassigned to Monterey. Several potential formation elements exist (black lines).

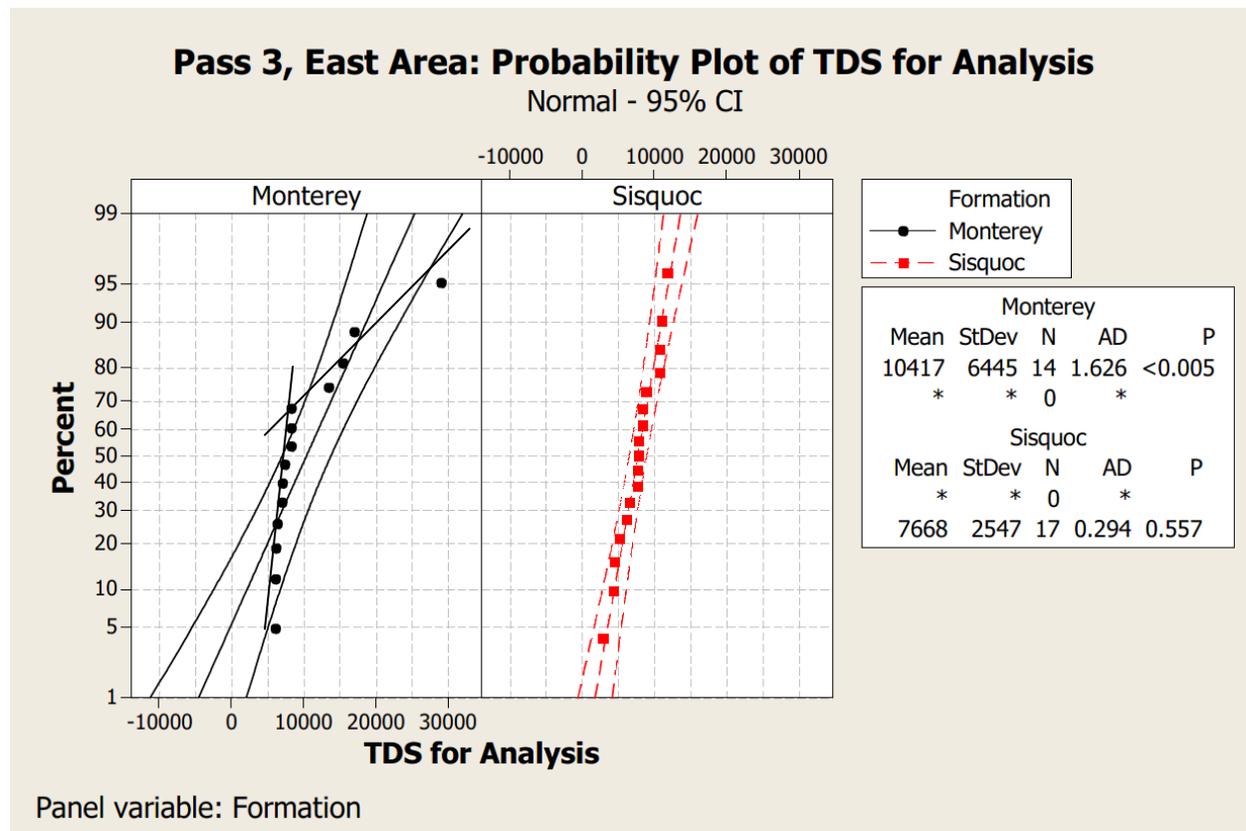


Figure 2.5-6

Table 2.5.2-1 East Area Formation Water

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis
E82	9/20/2014	8300728	East	Williams Holding	Williams Holding 1-18	Well	Monterey		29000.00
D4	12/6/2012	8322693	East	ERG	VIC G-7 Step rate 1	Well	Monterey		15390.00
E67	2/10/2012	8300004	East	GWP	GWP 87-24	Well	Monterey		13420.00
D6	11/25/2013	8322765	East	ERG	West 9	Well	Monterey		8300.00
D5	11/25/2013	8322758	East	Fleisher	Fleisher D4-M	Well	Monterey		8300.00
E64	11/25/2013	8322765	East	West	West 9	Well	Monterey		8260.00
E70	11/25/2013	8322770	East	West	West 10	Well	Monterey		7380.00
B3	3/31/1983		East	Shell Field Fee	WW	WW	Monterey		7018.00
E81	8/11/1965	8301295	East	Williams B	Williams B-4	SC Well	Monterey		6172.00
D7	11/25/2013	8322770	East	ERG	West 10	Well	Monterey		6100.00
E83	3/11/1977	8321048	East	Williams B	Williams B-14	SC Well	Monterey		6070.00
E117	1/11/1979	8321180	East	GWP	GWP 46A-24	SC Well	Sisquoc	S2-S3	11800.00
E115	7/31/2013	8322691	East	Victory	Victory G1	Well	Sisquoc	S6-S8	11047.00
C6	7/13/2013	8322691	East	Victory	G1	Well	Sisquoc	S2-S9	10720.00
D1	7/31/2013	8322694	East	ERG	Cat Canyon 10 FLD G-2	Well	Sisquoc	S2-S8	10720.00
E90	10/22/1971	8320044	East	Field Fee	Field Fee 18	Well	Sisquoc	Brooks	8860.00
B1e1	6/21/1966	8301177	East	R&G	25	Well	Sisquoc		8358.00
B7b	10/29/1971	8320044	East	Field Fee	Field Fee 18-31	Well	Sisquoc	Brooks	8322.00
C5	12/10/2012	8321254	East	Recruit Fee	821-25	SC Well	Sisquoc	S1b	7800.00
D2	7/25/1967	8321048	East	Williams B	R-14-B	SC Well	Sisquoc	Brooks	7740.00
E106	11/14/1972	8320368	East	Recruit Fee	Recruit Fee 21-25	SC Well	Sisquoc	S1B	7710.00
E105	2/28/2012	8321563	East	Williams Holding	Williams Holding 835	SC Well	Sisquoc	S1B	7700.00
B7a	10/22/1971	8320043	East	Field Fee		WD	Sisquoc	Brooks	6631.00
F9	8/11/1965	8301295	East	Williams B	B-4	SC Well	Sisquoc		6172.00
D3	7/25/1967	8301310	East	ERG	Stendel 1	Well	Sisquoc	Brooks	5155.00
C7	2/1/1975	8300085	East	Westco-Petan	B75	Well	Sisquoc	S1b-S2	4455.00
B18b	7/8/1981		East	ERG	Produced Water to HWT	Tank	Sisquoc		4300.00
B4b	9/12/1980	8321160	East	Getty Oil	GWP 401-24	Well	Sisquoc	S1b	2870.00
F10	3/23/1977	8321048	East	Williams B	B-14	SC Well	Monterey		16995.00
B1e3	6/21/1966	8300270	East	R&G	0-45	Well	Monterey		7059.00
E75	9/12/2013	8321101	East	Williams Holding	Williams Holding 5	Well	Monterey		6370.00

2.5.3 West Area

Sisquoc formation showed potential signs of early return water sampling from the production cycle and a possible sealing fault passing through both Sisquoc and Monterey in the West Area. The sample API 08300313 Los Alamos 31 reported in the West Area sample was rejected from the West Area as incorrect completion location (it is correct for the sample to be attributed to the Central Area). Two Los Flores waste water samples and four Hunter Cat Wastewater samples were rejected. Several potential formation elements exist (black lines).

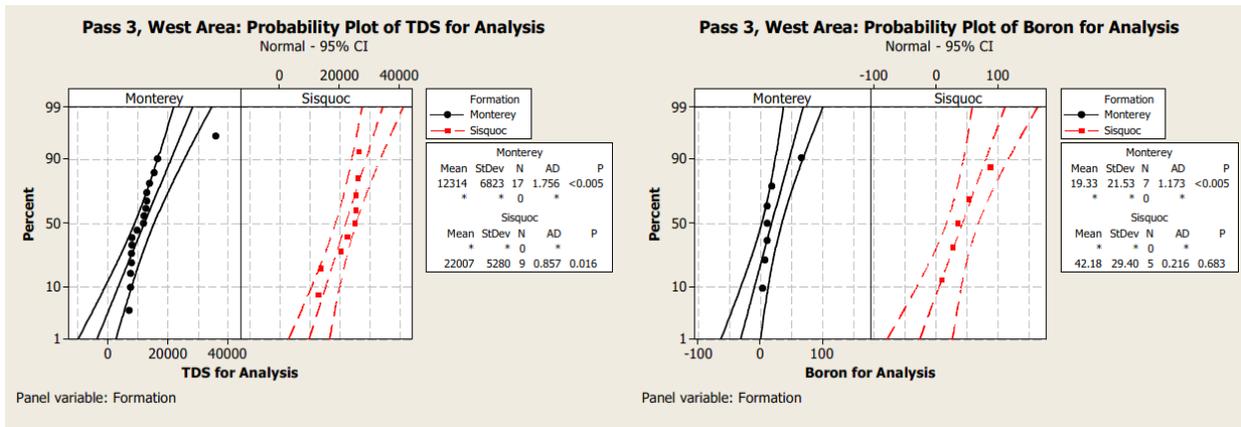


Figure 2.5-7

Table 2.5.3-1 West Area Formation Water

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
E77	5/10/2006	8301302	West	Brooking	Brooking 54	Well	Monterey		36000.00	
F3	10/8/1982	8321721	West	Los Alamos	LA 162	Well	Monterey		16549.00	67.00
E73		8301252	West	Los Flores	LOS FLORES NO. 77 - 21	Well	Monterey		15563.00	
E23	11/30/1981	8321400	West	White	White 1	Well	Monterey		14000.00	19.59
E66	6/1/1974	8301427	West	Dominion/UCB	DOMINION #47	Well	Monterey		13048.96	
E68	2/10/2012	8320232	West	Los Alamos	Los Alamos 156	Well	Monterey		13010.00	12.31
E71	6/1/1974	8320646	West	Dominion/UCB	UCB #1	Well	Monterey		12713.65	
F2	12/11/1974	8320137	West	Los Alamos	LA 153	Well	Monterey		12176.00	
F4a	1/18/1984	8321839	West	Los Alamos	LA 165	Well	Monterey		12049.00	
E54		8301424	West	Dominion/UCB	DOMINION WELL NO 38	Well	Monterey		9828.32	
E56	2/10/2012	8321719	West	Los Alamos	Los Alamos 160	Well	Monterey		8130.00	12.31
E60	2/10/2012	8321720	West	Los Alamos	Los Alamos 161	Well	Monterey		8030.00	11.75
E76		8301492	West	Bell	BELL NO. 12	Well	Monterey		7890.00	4.37
F1	7/7/1976	8300395	West	Los Alamos	Well 23	Well	Monterey		7880.00	
F4b	1/18/1984	8321720	West	Los Alamos	LA 161	Well	Monterey		7714.00	
B1e2	6/21/1966	8300662	West	R&G	0-40	Well	Monterey		7572.00	8.00
F4c	10/13/1983	8320232	West	Los Alamos	LA 156	Well	Monterey		7177.00	
E111	10/22/1974	8300435	West	UCB	UCB O-12	Well	Sisquoc	S1B	26444.00	
E103	4/20/1971	8300350	West	Los Alamos	Los Alamos 2	Well	Sisquoc	S2-S5	26153.90	86.86
E110	10/22/1974	8300012	West	UCB	UCB O-18	Well	Sisquoc	S1B	25369.00	
C18	10/22/1974	8300012	West	UCB	0-18	Well	Sisquoc	Sib	25360.00	
E109	10/18/1974	8300137	West	UCB	UCB O-23	Well	Sisquoc	S1B	25100.00	
E118	4/24/1953	8301331	West	Alexander	Alexander 154	Well	Sisquoc	S6	22543.90	52.58
E93	7/17/1972	8301509	West	Bell	Bell 39	Well	Sisquoc	S2-S6A	20461.00	9.33
E92	3/12/1980	8300381	West	Los Alamos	Los Alamos 1	Well	Sisquoc	S2-S5	13730.00	34.70
E94	6/12/2012	8322760	West	Los Alamos	Los Alamos 325	Well	Sisquoc	S6-S9	12903.00	27.42

2.5.4 Central

Two samples were re-assigned to Sisquoc formation: Los Alamos 31 and Los Alamos 40. Two non-assigned samples were rejected: Williams and Williams 7. Several potential formation elements exist (black lines). One Los Alamos samples was identified as an injectate sample but the entry was reviewed and corrected, therefore the sample was kept.

Table 2.5.4-1 Central Area Formation Water

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
E97	6/12/2012	8300720	Central	Los Alamos	Los Alamos 54	Well	Sisquoc	S6-S9	17780.00	27.70
C1	11/23/1981	8320400	Central	Los Alamos	96	SC Well	Sisquoc	S1b	14645.00	
E104	11/14/1974	8320400	Central	Los Alamos	Los Alamos 96	SC Well	Sisquoc	S1B	14645.00	33.58
E96	6/12/2012	8300417	Central	Los Alamos	Los Alamos 60	Well	Sisquoc	S6-S9	14396.00	38.06
E95	6/12/2012	8300022	Central	Los Alamos	Los Alamos 120	Well	Sisquoc	S6-S9	12985.00	23.79
E100	3/2/2012	8300403	Central	Los Alamos	Los Alamos 33	Well	Sisquoc	S6-S9	12000.00	13.15
E101	11/14/1974	8300418	Central	Los Alamos	Los Alamos 62	Well	Sisquoc	S1B	11800.00	37.78
E102	11/14/1974	8320367	Central	Los Alamos	Los Alamos 93	SC Well	Sisquoc	S1B	9580.00	34.98
E89	10/21/1981	8321640	Central	Los Alamos	Los Alamos 98	Well	Sisquoc	S2-S3	8710.00	1.82
B18a	4/20/1971	8300313	Central	Los Alamos	Los Alamos #31	WF	Sisquoc		7929.00	76.00
B5b	3/4/1966	8300313	Central	Los Alamos	Los Alamos 31	WF	Sisquoc		7844.00	
C3	4/28/1980	8300409	Central	Los Alamos	40	Well	Sisquoc	S6S9	6100.00	
E88	4/28/1980	8300409	Central	Los Alamos	Los Alamos 40	Well	Sisquoc	S6-S9	6100.00	12.03
B16a	6/20/1997		Central	Williams B	Williams #7	SC Well	Sisquoc		5920.00	9.20

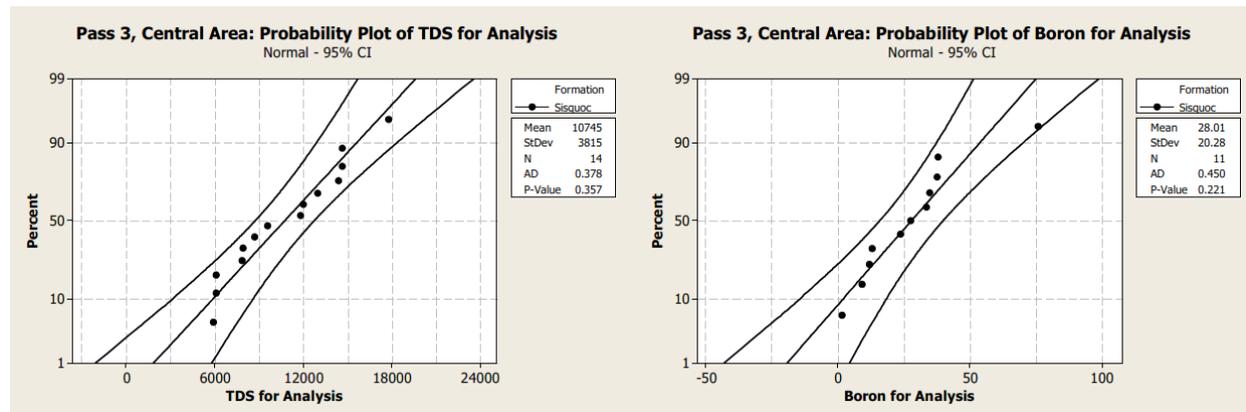


Figure 2.5-8

In the Central Area the Sisquoc Sands were steamed therefore the lower values could be attributed to steam condensate diluting the formation water during the production cycle. While several samples show typical random ranges of results, a review of the correlations show no inconsistencies in the formation analyses that would lead to a conclusion that the Central Area Sisquoc lower [TDS] samples were diluted. Therefore, the distribution may be attributed Sisquoc Sands elements that are isolated from one another by interposing silts and clays and the long term introduction of reinjected water.

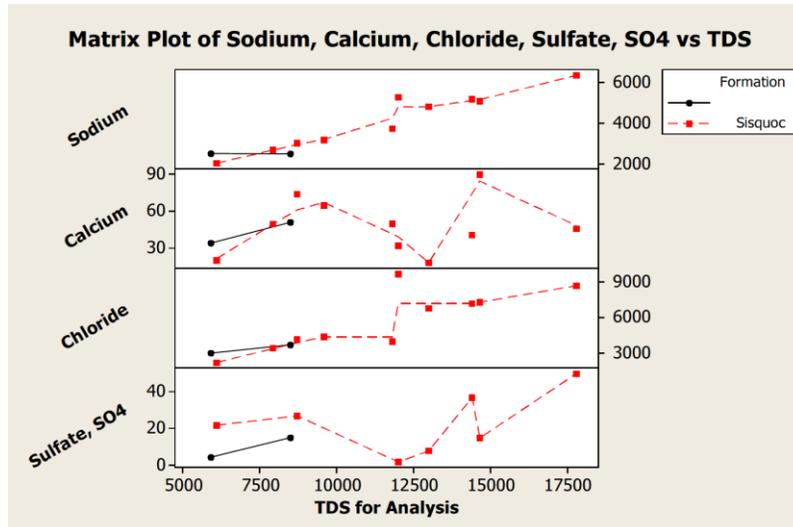


Figure 2.5-9

2.5.5 Gato Ridge Area

Gato Ridge data indicate that there were mostly Monterey Formation Completions in the Area. There were samples from some wells that were completed in both the Monterey and Sisquoc, however most production was expected to be from the Monterey Formation. One well (A-6) was a disposal well completed in the Sisquoc but it was a poor performer due to the limited reservoir space and was quickly abandoned. The table and the charts below show the results of the analysis.

Table 2.5.5-1 Gato Ridge Area Formation Water

Reference No.	Date	API Number	Area	Lease	Well Name/Description	Sample Type	Formation	Subformation	TDS for Analysis	Boron for Analysis
E49	8/30/1983	8301398	Gato Ridge	Tognazzini	Tog 1A	Well	Monterey		14278.00	15.95
E43	9/14/1983	8301398	Gato Ridge	Tognazzini	Tog 1A	WD	Monterey		11353.00	12.31
F5l	5/30/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		10225.00	
E15	10/13/1983	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		10222.00	43.65
E79	5/14/2015	8301407	Gato Ridge	Tognazzini	Tog 51	Well	Monterey		10020.00	1.87
B12		8301407	Gato Ridge	Tognazzini	Tog 51	Well	Monterey		10000.00	6.70
E18	11/4/1983	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		9906.00	34.70
E9	8/30/1983	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		9894.60	27.79
E14	11/4/1983	8301400	Gato Ridge	Tognazzini	Tog 315	WD	Monterey		9824.00	31.98
F5b	12/15/1983	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		9750.00	
E30	12/1/1983	8301400	Gato Ridge	Tognazzini	Tog 315	WD	Monterey		9660.90	39.79
E16	8/1/1983	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		9633.00	19.84
E51	8/30/1983	8301407	Gato Ridge	Tognazzini	Tog 51	Well	Monterey		9604.00	15.95
E17	1/16/1984	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		9578.50	42.70
F5d	1/20/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		9450.00	
E46	1/20/1984	8301443	Gato Ridge	Tognazzini	Tog 3	Well	Monterey		9449.70	30.95
E61	1/16/1984	8301415	Gato Ridge	Tognazzini	Tog 349	Well	Monterey		9428.70	50.93
F5k	5/25/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		9365.00	
E40	2/3/1984	8301452	Gato Ridge	Tognazzini	Tog 14	Well	Monterey		9340.60	39.96
E31	8/1/1983	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		9227.00	21.04
E24	10/13/1983	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		9214.00	43.64
E41	12/1/1983	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		9183.50	38.76
E22	11/4/1983	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		9161.00	36.03
F5c	12/29/1983	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		9143.00	
E19	9/14/1983	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		9122.00	29.38
E37	12/1/1983	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		9121.10	46.03
F5g	3/7/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		9085.00	
E59	3/7/1984	8301443	Gato Ridge	Tognazzini	Tog 3	Well	Monterey		9084.50	65.51
E32	9/14/1983	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		9037.00	26.30
F6	5/25/1949	8301403	Gato Ridge	Tognazzini	Tog 23	Well	Monterey		8998.00	25.00
E27	10/13/1983	8301400	Gato Ridge	Tognazzini	Tog 315	Well	Monterey		8979.00	43.65
F5f	2/17/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		8926.00	
E57	2/17/1984	8301443	Gato Ridge	Tognazzini	Tog 3	Well	Monterey		8925.50	27.42
F5h	3/26/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		8903.00	
E12	8/30/1983	8301414	Gato Ridge	Tognazzini	Tog 348C	Well	Monterey		8891.10	23.81
1	9/6/2016	8301414	Gato Ridge	Tognazzini	348C	Well	Monterey		8800.00	14.00
E55	8/30/1983	8301443	Gato Ridge	Tognazzini	Tog 53	Well	Monterey		8794.00	19.84
F5a	8/30/1983	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		8794.00	
E36	1/16/1984	8301412	Gato Ridge	Tognazzini	Tog 336	Well	Monterey		8714.20	47.40
E20	8/30/1983	8301400	Gato Ridge	Tognazzini	Tog 315	Well	Monterey		8657.50	27.70
E42	1/16/1984	8301400	Gato Ridge	Tognazzini	Tog 315	Well	Monterey		8645.90	54.85
E58	1/20/1984	8301452	Gato Ridge	Tognazzini	Tog 14	Well	Monterey		8554.90	19.98
F5e	2/3/1984	8301443	Gato Ridge	Magenheimer	TOG #3	Well	Monterey		8401.00	
E62	2/3/1984	8301443	Gato Ridge	Tognazzini	Tog 53	Well	Monterey		8400.60	39.96
E52	8/30/1983	8301408	Gato Ridge	Tognazzini	Tog 52	Well	Monterey		7951.00	15.95
E50	6/2/2011	8301403	Gato Ridge	Tognazzini	Tog 23	Well	Monterey		7800.00	8.95
F7	6/2/2011	8301404	Gato Ridge	Tognazzini	Tog 24	Well	Monterey		7800.00	32.00
E47	11/5/1976	8301455	Gato Ridge	Tognazzini	TOGNAZZINI #17 SWD	WD	Monterey		7630.43	
E69	8/30/1983	8301413	Gato Ridge	Tognazzini	Tog 337	Well	Monterey		7159.00	27.79
C8	11/29/2016	8301224	Gato Ridge	Magenheimer	A6	Well	Sisquoc	Thomas	21000.00	
B11b	5/5/1976	8301655	Gato Ridge	Tognazzini	Tog 43-A	WD	Monterey		11500.00	
B11a	7/16/1992	8301453	Gato Ridge	Tognazzini	Well 15 WW	WD	Monterey		8390.00	13.00
13	4/19/2015	8301414	Gato Ridge	Magenheimer	Tog #348C	Well	Monterey		8020.00	9.60
7	8/21/2015	8301383	Gato Ridge	Magenheimer	Mag #541	Well	Monterey		7500.00	
9	9/1/2015	8301436	Gato Ridge	Magenheimer	Mag #B-5 sect 4	Well	Monterey		7000.00	
8	9/1/2015	8301381	Gato Ridge	Magenheimer	Mag #511	Well	Monterey		7000.00	
B13e	3/31/1983		Gato Ridge	Magenheimer	Lease Water	Tank	??		6934.00	30.00
11	9/17/2015	8321724	Gato Ridge	Magenheimer	Mag #25	Well	Sisquoc/Monterey		6500.00	
12	9/17/2015	8301154	Gato Ridge	Magenheimer	Mag #A-5 sect 9	Well	Sisquoc/Monterey		6300.00	
B13c	1/9/1991		Gato Ridge	Petro Minerals	Magenheimer I	WW	??		6278.00	10.00
10	9/17/2015	8321595	Gato Ridge	Magenheimer	Mag #24	Well	Sisquoc/Monterey		6200.00	
B13a			Gato Ridge	Magenheimer Arata	Produced Water 1	Tank	??		3900.00	9.60

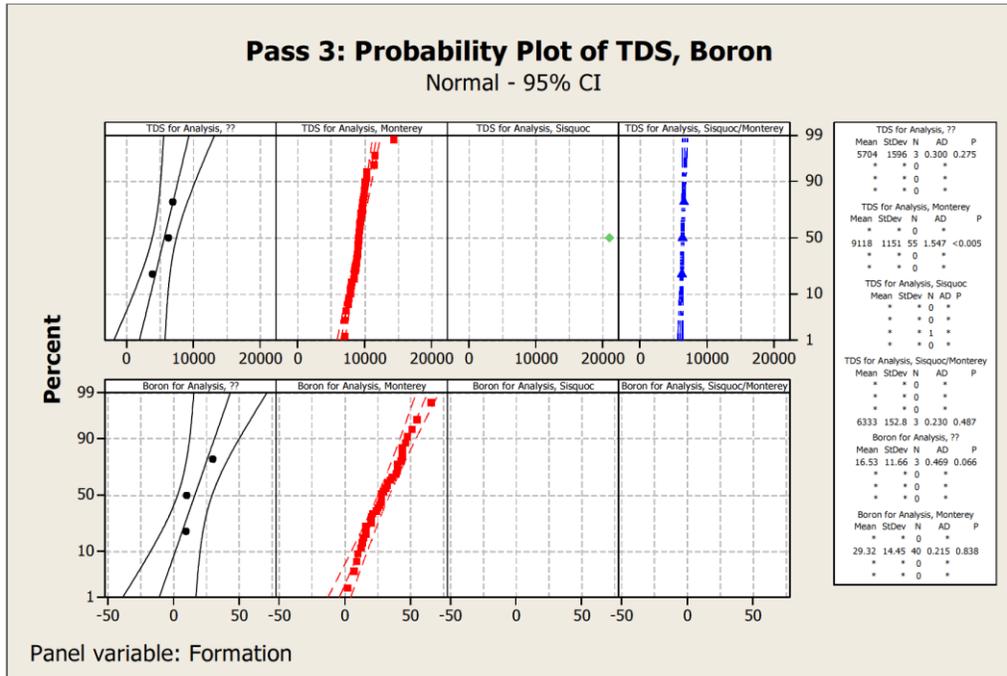


Figure 2.5-10

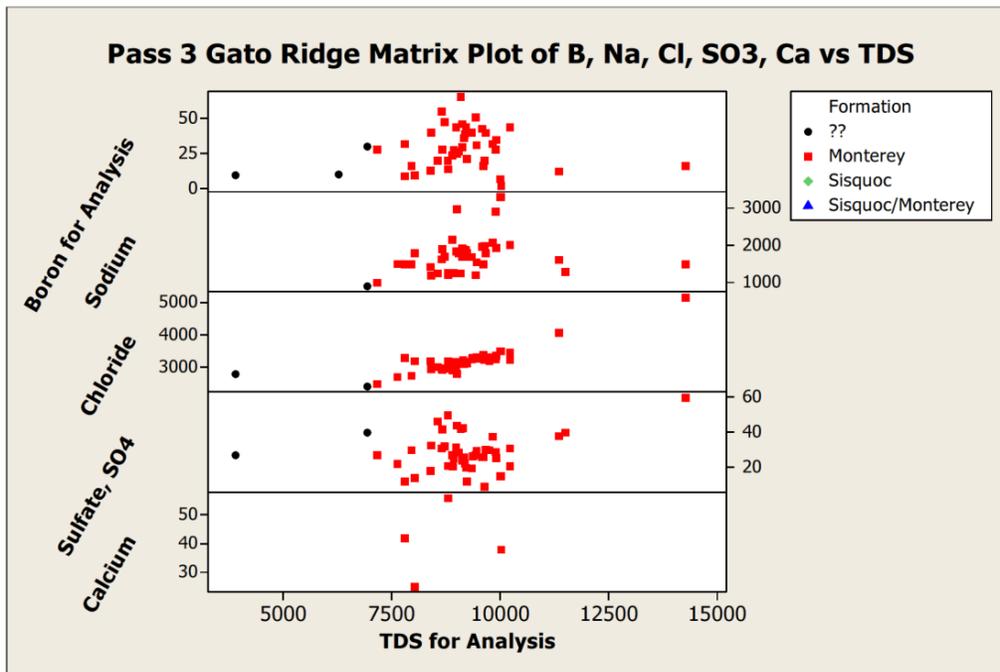


Figure 2.5-11

2.5.6 Final Reviewed Results

Table 2.5.6-1: Summary of Reviewed Data by Area and Formation(mg/L)											
Area	Formation		TDS	B	Na	CL	SO4	HCO3	Ca	K	Mg
Sisquoc	Average Sisquoc	Mean	9990	26	1151	3266	116	4680	110	47	214
		Std Dev.	8028	9	721	2812	218	5196	51	59	177
		Count	38	28	28	36	27	29	9	27	27
	Post Steaming Production	Mean	5862	26	961	1924	75	2209	104	41	247
		Std Dev.	2600	9	426	1200	46	1572	50	60	179
		Count	27	25	22	27	22	22	8	22	21
	Native Sisquoc Formation	Mean	19862	34	2311	7436	295	11004	113	71	91
		Std Dev.	7558	17	1612	2269	500	6143	67	46	113
		Count	12	4	7	10	5	8	2	6	7
	Monterey	Mean	10417	7	1153	3216	57	4657	82	26	98
		Std Dev.	6445	5	798	1828	51	2395	73	23	82
		Count	14	14	14	14	14	14	6	14	12
Central	Sisquoc	Mean	10745	28	1641	4001	47	5539	29	36	21
		Std Dev.	3815	20	801	1420	22	2496	8	24	17
		Count	14	11	11	11	11	11	4	11	8
	Monterey	Mean	12314	19	1188	4033	67	5109	44	41	56
		Std Dev.	6823	22	454	1958	87	2221	7	68	37
		Count	17	7	16	16	17	17	5	16	15
East	Monterey	Mean	10417	7	1153	3216	57	4657	82	26	98
		Std Dev.	6445	5	798	1828	51	2395	73	23	82
		Count	14	14	14	14	14	14	6	14	12
	Sisquoc	Mean	7668	12	1263	2740	27	3528	41	16	75
		Std Dev.	2547	12	768	1019	20	1806	12	11	51
		Count	17	9	14	14	14	14	2	13	13
West	Monterey	Mean	12314	19	1188	4033	67	5109	44	41	56
		Std Dev.	6823	22	454	1958	87	2221	7	68	37
		Count	17	7	16	16	17	17	5	16	15
	Sisquoc	Mean	22007	42	876	8063	147	12252	15	50	49
		Std Dev.	5280	29	442	2096	103	3700		28	94
		Count	9	5	8	8	8	8	1	8	5
Gato Ridge	Monterey	Mean	9118	29	1769	3207	29	4003	41	14	62
		Std Dev.	1151	14	528	367	11	698	11	10	74
		Count	55	40	42	51	52	42	5	40	34
	Sisquoc	Mean	21000								
		Std Dev.									
		Count	1								
	Sisquoc/ Monterey	Mean	6333								
		Std Dev.	153								
		Count	3								

Appendix III

SECURITIES AND EXCHANGE COMMISSION

WASHINGTON, D.C. 20549

FORM 10-K

FOR ANNUAL AND TRANSITION REPORTS
PURSUANT TO SECTION 13 OR 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934

(Mark One)

- [X] Annual Report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the fiscal year ended December 31, 2016 or
[] Transition report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the transition period from to

Table with 3 columns: Commission File Number, Registrant, State of Incorporation Address, Zip Code and Telephone Number, and IRS Employer Identification No. Rows include American States Water Company and Golden State Water Company.

Securities registered pursuant to Section 12(b) of the Act:

Table with 2 columns: Title of Each Class and Name of Each Exchange on Which Registered. Row: American States Water Company Common Shares, New York Stock Exchange.

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the Registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

- American States Water Company Yes [X] No []
Golden State Water Company Yes [] No [X]

Indicate by check mark if the Registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act.

- American States Water Company Yes [] No [X]
Golden State Water Company Yes [] No [X]

Indicate by check mark whether Registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that Registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

- American States Water Company Yes [X] No []
Golden State Water Company Yes [X] No []

Indicate by check mark whether Registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or such shorter period that the Registrant was required to submit and post such files).

- American States Water Company Yes [X] No []
Golden State Water Company Yes [X] No []

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of Registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. []

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See definition of "large accelerated filer", "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act. (Check one):

American States Water Company

Large accelerated filer

Accelerated filer

Non-accelerated filer

Smaller reporting company

Golden State Water Company

Large accelerated filer

Accelerated filer

Non-accelerated filer

Smaller reporting company

Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act)

American States Water Company

Yes No

Golden State Water Company

Yes No

The aggregate market value of all voting Common Shares held by non-affiliates of American States Water Company was approximately \$1,601,802,000 and \$1,629,577,000 on June 30, 2016 and February 21, 2017, respectively. The closing price per Common Share of American States Water Company on February 21, 2017, as quoted in *The Wall Street Journal website*, was \$44.54. As of February 21, 2017, the number of Common Shares of American States Water Company outstanding was 36,586,831. As of that same date, American States Water Company owned all 146 outstanding Common Shares of Golden State Water Company. The aggregate market value of all voting stock held by non-affiliates of Golden State Water Company was zero on June 30, 2016 and February 21, 2017.

Golden State Water Company meets the conditions set forth in General Instruction I(1)(a) and (b) of Form 10-K and is therefore filing this Form, in part, with the reduced disclosure format for Golden State Water Company.

Documents Incorporated by Reference:

Portions of the Proxy Statement of American States Water Company will be subsequently filed with the Securities and Exchange Commission as to Part III, Item Nos. 10, 11, 13 and 14 and portions of Item 12, in each case as specifically referenced herein.

AMERICAN STATES WATER COMPANY
and
GOLDEN STATE WATER COMPANY

FORM 10-K

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PART I

Item 1. Business

This annual report on Form 10-K is a combined report being filed by two separate Registrants, American States Water Company (“AWR”) and Golden State Water Company (“GSWC”). References in this report to “Registrant” are to AWR and GSWC, collectively, unless otherwise specified. GSWC makes no representations as to the information contained in this report relating to AWR and its subsidiaries, other than GSWC.

AWR makes its periodic reports, Form 10-Q and Form 10-K, and current reports, Form 8-K, available free of charge through its website, www.aswater.com, as soon as material is electronically filed with or furnished to the Securities and Exchange Commission (“SEC”). Such reports are also available on the SEC’s website at www.sec.gov. AWR also makes available free of charge its code of business conduct and ethics, its corporate governance guidelines and the charters of its Board of Directors, Nominating and Governance Committee, Compensation Committee, and Audit and Finance Committee through its website or by calling (800) 999-4033. AWR and GSWC have filed the certification of officers required by Section 302 of the Sarbanes-Oxley Act as Exhibits 31.1 and 31.2 to its Form 10-K for the year ended December 31, 2016.

Overview

AWR is the parent company of GSWC and American States Utility Services, Inc. (“ASUS”) (and its wholly owned subsidiaries Fort Bliss Water Services Company (“FBWS”), Terrapin Utility Services, Inc. (“TUS”), Old Dominion Utility Services, Inc. (“ODUS”), Palmetto State Utility Services, Inc. (“PSUS”), Old North Utility Services, Inc. (“ONUS”) and Emerald Coast Utility Services, Inc. (“ECUS”). AWR was incorporated as a California corporation in 1998 as a holding company. AWR has three reportable segments: water, electric and contracted services. Within the segments, AWR has two principal business units, water and electric service utility operations, conducted through GSWC, and contracted services conducted through ASUS and its subsidiaries. FBWS, TUS, ODUS, PSUS, ONUS and ECUS may be referred to herein collectively as the “Military Utility Privatization Subsidiaries.”

GSWC is a public utility engaged principally in the purchase, production, distribution and sale of water in 10 counties in the State of California. GSWC is regulated by the California Public Utilities Commission (“CPUC”). It was incorporated as a California corporation on December 31, 1929. GSWC also distributes electricity in several San Bernardino County mountain communities in California through its Bear Valley Electric Service (“BVES”) division.

GSWC served 261,002 water customers and 23,940 electric customers at December 31, 2016, or a total of 284,942 customers, compared with 260,151 water customers and 23,846 electric customers at December 31, 2015, or a total of 283,997 customers. GSWC’s operations exhibit seasonal trends. Although GSWC’s water utility operations have a diversified customer base, residential and commercial customers account for the majority of GSWC’s water sales and revenues. Revenues derived from commercial and residential water customers accounted for approximately 90% of total water revenues for the years ended December 31, 2016, 2015 and 2014.

ASUS, itself or through the Military Utility Privatization Subsidiaries, has contracted with the U.S. government to provide water and/or wastewater services at various military installations. ASUS operates, maintains and performs construction activities (including renewal and replacement capital work) on water and/or wastewater systems at various United States military bases pursuant to 50-year firm, fixed-price contracts. Each of the contracts with the U.S. government is subject to termination, in whole or in part, prior to the end of its 50-year term for convenience of the U.S. government or as a result of default or nonperformance by the subsidiary performing the contract. The contract price for each of these contracts is subject to either (i) redetermination every three years following the initial two years of the contract or (ii) annually under an economic price adjustment. Contracts are also subject to equitable price adjustments and modifications for changes in circumstances, changes in laws and regulations, additions to the contract value for new construction of facilities at the military bases and changes in wages and fringe benefits to the extent provided in the contract. AWR guarantees performance of ASUS’s military privatization contracts.

Pursuant to the terms of these contracts, the Military Utility Privatization Subsidiaries operate the following water and wastewater systems:

- FBWS - water and wastewater systems at Fort Bliss located near El Paso, Texas and extending into southeastern New Mexico;
- TUS - water and wastewater systems at Joint Base Andrews in Maryland;

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- ODUS - wastewater system at Fort Lee in Virginia and the water and wastewater systems at Joint-Base Langley Eustis and Joint Expeditionary Base Little Creek-Fort Story in Virginia (“TRADOC”);
- PSUS - water and wastewater systems at Fort Jackson in South Carolina;
- ONUS - water and wastewater systems at Fort Bragg, Pope Army Airfield and Camp Mackall, North Carolina; and
- ECUS - water and wastewater systems at Eglin Air Force Base in Florida expected to begin operation in the spring of 2017 pursuant to a contract awarded in July 2016.

Certain financial information for each of AWR’s business segments - water distribution, electric distribution, and contracted services - is set forth in Note 15 to the Notes to Consolidated Financial Statements of American States Water Company and its subsidiaries. AWR’s water and electric distribution segments are not dependent upon a single or only a few customers. The U.S. government is the primary customer for ASUS’s contracted services. ASUS, from time to time, performs work at military bases for other prime contractors of the U.S. government.

The revenue from AWR’s segments is seasonal. The impact of seasonality on these AWR businesses is discussed in more detail in Item 1A. “*Risk Factors.*”

Environmental matters and compliance with such laws and regulations are discussed in detail in Item 7. “*Management’s Discussion and Analysis of Financial Condition and Results of Operation*” under the section titled “Environmental Matters.”

Competition

The businesses of GSWC are substantially free from direct and indirect competition with other public utilities, municipalities and other public agencies within their existing service territories. However, GSWC may be subject to eminent domain proceedings in which governmental agencies, under state law, may acquire GSWC’s water systems if doing so is necessary and in the public’s interest. GSWC competes with governmental agencies and other investor-owned utilities in connection with offering service to new real estate developments on the basis of financial terms, availability of water and ability to commence providing service on a timely basis. ASUS actively competes for business with other investor-owned utilities, other third party providers of water and/or wastewater services and governmental entities primarily on the basis of quality of service and price.

AWR Workforce

AWR and its subsidiaries had a total of 736 employees as of January 31, 2017. GSWC had 563 employees as of January 31, 2017. Fourteen employees of BVES are covered by a collective bargaining agreement with the International Brotherhood of Electrical Workers, which expires in December 2017.

ASUS had 173 employees as of January 31, 2017. Sixteen of FBWS’s employees are covered by a collective bargaining agreement with the International Union of Operating Engineers. This agreement expires in September 2017.

Forward-Looking Information

This Form 10-K and the documents incorporated herein contain forward-looking statements intended to qualify for the “safe harbor” from liability established by the Private Securities Litigation Reform Act of 1995. Forward-looking statements are based on current estimates, expectations and projections about future events and assumptions regarding these events and include statements regarding management’s goals, beliefs, plans or current expectations, taking into account the information currently available to management. Forward-looking statements are not statements of historical facts. For example, when we use words such as “anticipate,” “believe,” “plan,” “estimate,” “expect,” “intend,” “may” and other words that convey uncertainty of future events or outcomes, we are making forward-looking statements. We are not able to predict all the factors that may affect future results. We caution you that any forward-looking statements made by us are not guarantees of future performance and the actual results may differ materially from those in our forward-looking statements. Some of the factors that could cause future results to differ materially from those expressed or implied by our forward-looking statements or from historical results, include, but are not limited to:

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- the outcome of pending and future regulatory, legislative or other proceedings, investigations or audits, including decisions in GSWC's general rate cases and the results of independent audits of GSWC's construction contracting procurement practices or other independent audits of our costs;
- changes in the policies and procedures of the CPUC;
- timeliness of CPUC action on rates;
- availability of GSWC's water supplies, which may be adversely affected by drought, changes in weather patterns in the West, contamination, and court decisions or other governmental actions restricting the use of water from the Colorado River, the California State Water Project, and/or pumping of groundwater;
- our ability to efficiently manage GSWC capital expenditures and operating and maintenance expenses within CPUC authorized levels and timely recover our costs through rates;
- the impact of opposition to GSWC rate increases on our ability to recover our costs through rates, including costs associated with construction of pipelines to connect to alternative sources of water, new wells to replace wells that are no longer in service (or are otherwise inadequate to meet the needs of our customers), and other facilities to conserve or reclaim water;
- the impact of opposition by GSWC customers to rate increases associated with the implementation of tiered rate structures as well as restrictions on water use mandated in California as a result of drought, which decreases adopted usage and increases customer rates;
- the impact of condemnation actions on future GSWC revenues and other aspects of our business if we do not receive adequate compensation for the assets acquired, or recovery of all charges associated with the condemnation of these assets, and the impact on future revenues if we are no longer entitled to any portion of the revenues generated from these assets;
- liabilities of GSWC associated with the inherent risks of damage to private property and injuries to employees and the general public if they should come into contact with electrical current or equipment, including through downed power lines or equipment malfunctions, or if safe construction and maintenance work sites are not maintained;
- our ability to forecast the costs of maintaining GSWC's aging water and electric infrastructure;
- our ability to recover increases in permitting costs and in costs associated with negotiating and complying with the terms of our franchise agreements with cities and counties and other demands made upon us by the cities and counties in which GSWC operates;
- changes in accounting valuations and estimates, including changes resulting from our assessment of anticipated recovery of GSWC's regulatory assets, liabilities and revenues subject to refund or regulatory disallowances and the timing of such recovery, and the amounts set aside for uncollectible accounts receivable, inventory obsolescence, pensions and post-retirement liabilities, taxes and uninsured losses and claims, including general liability and workers' compensation claims;
- changes in environmental laws, health and safety laws and water and wastewater quality requirements and increases in costs associated with complying with these laws and requirements, including costs associated with GSWC upgrading and building new water treatment plants, GSWC disposing of residuals from our water treatment plants, handling and storing hazardous chemicals, compliance monitoring activities and GSWC securing alternative supplies of water when necessary;
- our ability to obtain adequate, reliable and cost-effective supplies of chemicals, electricity, fuel, water and other raw materials that are needed for our water and wastewater operations;
- our ability to attract, retain, train, motivate, develop and transition key employees;
- our ability to recover the costs associated with the contamination of GSWC's groundwater supplies from parties responsible for the contamination or through the ratemaking process, and the time and expense incurred by us in obtaining recovery of such costs;

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- adequacy of our electric division's power supplies and the extent to which we can manage and respond to the volatility of electricity and natural gas prices;
- our electric division's ability to comply with the CPUC's renewable energy procurement requirements;
- changes in GSWC long-term customer demand due to changes in customer usage patterns as a result of conservation efforts, regulatory changes affecting demand such as mandatory restrictions on water use, new landscaping or irrigation requirements, recycling of water by customers or purchase of recycled water supplied by other parties, unanticipated population growth or decline, changes in climate conditions, general economic and financial market conditions and cost increases, which may impact our long-term operating revenues if we are unable to secure rate increases, if growth in the residential customer base does not occur to the extent necessary to offset the decline in per-customer residential usage or GSWC's customer base declines as a result of condemnation actions or the use of recycled or reclaimed water from other third-party sources;
- changes in accounting treatment for regulated utilities;
- effects of changes in or interpretations of tax laws, rates or policies;
- changes in estimates used in ASUS's revenue recognition under the percentage of completion method of accounting for construction activities;
- termination, in whole or in part, of one or more of our military utility privatization contracts to provide water and/or wastewater services at military bases for the convenience of the U.S. government or for default;
- suspension or debarment for a period of time from contracting with the government due to violations of federal law or regulations in connection with military utility privatization activities;
- delays by the U.S. government in making timely payments to ASUS for water and/or wastewater services at military bases as a result of fiscal uncertainties over the funding of the U.S. government or otherwise;
- delays in obtaining redetermination of prices or economic price or equitable adjustments to our prices on one or more of our contracts to provide water and/or wastewater services at military bases;
- disallowance of costs on any of our contracts to provide water and/or wastewater services at military bases as a result of audits, cost reviews or investigations by contracting agencies;
- inaccurate assumptions used in preparing bids in our contracted services business or negotiating periodic price adjustments;
- failure of the wastewater systems that we operate on military bases resulting in untreated wastewater or contaminants spilling into nearby properties, streams or rivers;
- failure to comply with the terms of our military privatization contracts;
- failure of any of our subcontractors to perform services for us in accordance with the terms of our military privatization contracts;
- competition for new military privatization contracts;
- issues with the implementation, maintenance or upgrading of our information technology systems;
- general economic conditions which may impact our ability to recover infrastructure investments and operating costs from customers;
- explosions, fires, accidents, mechanical breakdowns, the disruption of information technology and telecommunication systems, human error and similar events that may occur while operating and maintaining water and electric systems in California or operating and maintaining water and wastewater systems on military bases under varying geographic conditions;

- the impact of storms, earthquakes, floods, mudslides, drought, wildfires, disease and similar natural disasters, or acts of terrorism or vandalism, that affect customer demand or that damage or disrupt facilities, operations or information technology systems owned by us, our customers or third parties on whom we rely;
- potential costs, lost revenues, or other consequences resulting from misappropriation of assets or sensitive information, corruption of data, or operational disruption in connection with a cyber-attack or other cyber incident;
- increases in the cost of obtaining insurance or in uninsured losses that may not be recovered in rates, including increases due to difficulties in obtaining insurance for certain risks, such as wildfires and earthquakes in California;
- restrictive covenants in our debt instruments or changes to our credit ratings on current or future debt that may increase our financing costs or affect our ability to borrow or make payments on our debt; and
- our ability to access capital markets and other sources of credit in a timely manner on acceptable terms.

Please consider our forward-looking statements in light of these risks as you read this Form 10-K. We qualify all of our forward-looking statements by these cautionary statements.

Item 1A. Risk Factors

You should carefully read the risks described below and other information in this Form 10-K in order to understand certain of the risks of our business.

Our business is heavily regulated and, as a result, decisions by regulatory agencies and changes in laws and regulations can significantly affect our business

GSWC's revenues depend substantially on the rates and fees it charges its customers and the ability to recover its costs on a timely basis, including the ability to recover the costs of purchased water, groundwater assessments, electricity, natural gas, chemicals, water treatment, security at water facilities and preventative maintenance and emergency repairs. Any delays by the CPUC in granting rate relief to cover increased operating and capital costs at our public utilities or delays in obtaining approval of our requests at ASUS for economic price or equitable adjustments or price redeterminations for contracted services from the U.S. government may adversely affect our financial performance. We may file for interim rates in California in situations where there may be delays in granting final rate relief during a general rate case proceeding. If the CPUC approves lower rates, the CPUC will require us to refund to customers the difference between the interim rates and the rates approved by the CPUC. Similarly, if the CPUC approves rates that are higher than the interim rates, the CPUC may authorize us to recover the difference between the interim rates and the final rates. Interim rates may also be granted by the U.S. government should there be delays in the price redetermination process.

Regulatory decisions affecting GSWC may also impact prospective revenues and earnings, affect the timing of the recognition of revenues and expenses, may overturn past decisions used in determining our revenues and expenses and could result in impairment charges and customer refunds. Management continually evaluates the anticipated recovery of regulatory assets, liabilities and revenues subject to refund and provides for allowances and reserves as deemed necessary. In the event that our assessment of the probability of recovery through the ratemaking process is incorrect, we will adjust the associated regulatory asset or liability to reflect the change in our assessment or any regulatory disallowances. A change in our evaluation of the probability of recovery of regulatory assets or a regulatory disallowance of all or a portion of our costs could have a material adverse effect on our financial results.

We are also, in some cases, required to estimate future expenses and, in others, we are required to incur the expense before recovering costs. As a result, our revenues and earnings may fluctuate depending on the accuracy of our estimates, the timing of our investments or expenses or other factors. If expenses increase significantly over a short period of time, we may experience delays in recovery of these expenses, the inability to recover carrying costs for these expenses and increased risks of regulatory disallowances or write-offs.

Regulatory agencies may also change their rules and policies which may adversely affect our profitability and cash flows. Changes in policies of the U.S. government may also adversely affect one or more of our Military Utility Privatization Subsidiaries. In certain circumstances, the U.S. government may be unwilling or unable to appropriate funds to pay costs mandated by changes in rules and policies of federal or state regulatory agencies. The U.S. government may disagree with the

increases that we request and may delay approval of requests for equitable adjustment or redetermination of prices which could adversely affect our anticipated rates of return.

We may also be subject to fines or penalties if a regulatory agency, including the U.S. government, determines that we have failed to comply with laws, regulations or orders applicable to our businesses, unless we successfully appeal such an adverse determination. Regulatory agencies may also disallow certain costs if audit findings determine that we have failed to comply with our policies and procedures for procurement or other practices.

Our costs involved in maintaining water quality and complying with environmental regulation have increased and are expected to continue to increase

Our capital and operating costs at GSWC can increase substantially as a result of increases in environmental regulation arising from increases in the cost of upgrading and building new water treatment plants, disposing of residuals from our water treatment plants, compliance-monitoring activities and securing alternative supplies when necessary. GSWC may be able to recover these costs through the ratemaking process. We may also be able to recover these costs under settlement and contractual arrangements.

We may be subject to financial losses, penalties and other liabilities if we fail to maintain safe work sites

Our safety record is critical to our reputation. We maintain health and safety standards to protect our employees, customers, vendors and the public. Although we intend to adhere to such health and safety standards, it is unlikely that we will be able to avoid accidents at all times.

Our business sites, including construction and maintenance sites, often put our employees and others in close proximity with large pieces of equipment, moving vehicles, pressurized water, chemicals and other regulated materials. On many sites we are responsible for safety and, accordingly, must implement safety procedures. If we fail to implement such procedures or if the procedures we implement are ineffective or are not followed by our employees or others, our employees and others may be injured or die. Unsafe work sites also have the potential to increase our operating costs. Any of the foregoing could result in financial losses, which could have a material adverse impact on our business, financial condition, and results of operations.

In addition, our operations can involve the handling and storage of hazardous chemicals which, if improperly handled, stored or disposed of, could subject us to penalties or other liabilities. We are also subject to regulations dealing with occupational health and safety. Although we maintain functional employee groups whose primary purpose is to ensure that we implement effective health, safety, and environmental work procedures throughout our organization, including construction sites and maintenance sites, a failure to comply with such regulations could subject us to liability.

We may sustain losses that exceed or are excluded from our insurance coverage or for which we are not insured

We are, from time to time, parties to legal or regulatory proceedings. These proceedings may pertain to regulatory investigations, employment matters or other disputes. Management periodically reviews its assessment of the probable outcome of these proceedings, the costs and expenses reasonably expected to be incurred, and the availability and extent of insurance coverage. On the basis of this review, management establishes reserves for such matters. We may, however, from time to time be required to pay fines, penalties or damages that exceed our insurance coverage and/or reserves if our estimate of the probable outcome of such proceedings proves to be inaccurate.

We maintain insurance coverage as part of our overall legal and risk management strategy to minimize our potential liabilities. However, our insurance policies contain exclusions and other limitations that may not cover our potential liabilities. Generally, our insurance policies cover property, workers' compensation, employer liability, general liability and automobile liability. Each policy includes deductibles or self-insured retentions and policy limits for covered claims. As a result, we may sustain losses that exceed or that are excluded from our insurance coverage or for which we are not insured.

We have experienced increased costs and difficulties in obtaining insurance coverage for wildfires that could impact or potentially arise from BVES's ordinary operations. Uninsured losses and increases in the cost of insurance may not be recoverable in customer rates. A loss which is not insured or not fully insured or cannot be recovered in customer rates could materially affect GSWC's financial condition and results of operations.

Additional Risks Associated with our Public Utility Operations

Our operating costs may increase as a result of groundwater contamination

Our operations can be impacted by groundwater contamination in certain service territories. Historically, we have taken a number of steps to address contamination, including the removal of wells from service, decreasing the amount of groundwater pumped from wells in order to facilitate remediation of plumes of contaminated water, constructing water treatment facilities and securing alternative sources of supply from other areas not affected by the contamination. In emergency situations, we have supplied our customers with bottled water until the emergency situation has been resolved.

Our ability to recover these types of costs depends upon a variety of factors, including approval of rate increases, the willingness of potentially responsible parties to settle litigation and otherwise address the contamination and the extent and magnitude of the contamination. We may recover costs from certain third parties that may be responsible, or potentially responsible, for groundwater contamination. However, we often experience delays in obtaining recovery of these costs and incur additional costs associated with seeking recovery from responsible or potentially responsible parties which may adversely impact our liquidity. In some events we may be unable to recover all of these costs from third parties due to the inability to identify the potentially responsible parties, the lack of financial resources of responsible parties or the high litigation costs associated with obtaining recovery from responsible or potentially responsible parties.

We can give no assurance regarding the adequacy of any such recovery to offset the costs associated with contamination or the cost of recovery of any legal costs. To date, the CPUC has permitted us to establish memorandum accounts for potential recovery of these types of costs when they arise.

Management believes that rate recovery, proper insurance coverage and reserves are in place to appropriately manage these types of contamination issues. However, such issues, if ultimately resolved unfavorably to us, could, in the aggregate, have a material adverse effect on our results of operations and financial condition.

The adequacy of our water supplies depends upon weather and a variety of other uncontrollable factors

The adequacy of our water supplies varies from year to year depending upon a variety of factors, including:

- * rainfall, basin replenishment, flood control, snow pack levels in California and the West, reservoir levels and availability of reservoir storage;
- * availability of Colorado River water and imported water from the State Water Project;
- * the amount of usable water stored in reservoirs and groundwater basins;
- * the amount of water used by our customers and others;
- * water quality;
- * legal limitations on production, diversion, storage, conveyance and use; and
- * climate change.

The extended California drought and changes in weather patterns in the West and population growth in California cause increased stress on surface water supplies and groundwater basins. In addition, low or no allocations of water from the State Water Project and court-ordered pumping restrictions on water obtained from the Sacramento-San Joaquin Delta decrease or eliminate the amount of water Metropolitan Water District of Southern California ("MWD") and other state water contractors are able to import from northern California.

We have implemented tiered rates and other practices in order to encourage water conservation. We have also implemented programs to assist customers in complying with water usage reductions. Over the long term, we are acting to secure additional supplies from desalination and increase use of reclaimed water, where appropriate and feasible. We cannot predict the extent to which these efforts to reduce stress on our water supplies will be successful or sustainable, or the extent to which these efforts will enable us to continue to satisfy all of the water needs of our customers.

Water shortages at GSWC may:

- * adversely affect our supply mix, for instance, by causing increased reliance upon more expensive water sources;
- * adversely affect our operating costs, for instance, by increasing the cost of producing water from more highly contaminated aquifers or requiring us to transport water over longer distances, truck water to water systems or adopt other emergency measures to enable us to continue to provide water service to our customers;

- * result in an increase in our capital expenditures over the long term, for example, by requiring future construction of pipelines to connect to alternative sources of supply, new wells to replace those that are no longer in service or are otherwise inadequate to meet the needs of our customers, and other facilities to conserve or reclaim water;
- * adversely affect the volume of water sold as a result of such factors as mandatory or voluntary conservation efforts by customers, changes in customer conservation patterns, recycling of water by customers and imposition of new regulations impacting such things as landscaping and irrigation patterns;
- * adversely affect aesthetic water quality if we are unable to flush our water systems as frequently due to water shortages or drought restrictions; and
- * result in customer dissatisfaction and harm to our reputation if water service is reduced, interrupted or otherwise adversely affected as a result of the California drought, water contamination or other causes.

Our liquidity may be adversely affected by changes in water supply costs

We obtain our water supplies for GSWC from a variety of sources, which vary among our water systems. Certain systems obtain all of their supply from water that is pumped from aquifers within our service areas; some systems purchase all of the supply from wholesale suppliers; some systems obtain the supply from treating surface water sources; and other systems obtain the supply from a combination of wells, surface water sources and/or wholesale suppliers. The cost of obtaining these supplies varies, and overall costs can be impacted as use within a system varies from time to time. As a result, our cost of providing, distributing and treating water for our customers' use can vary significantly.

Furthermore, imported water wholesalers, such as MWD, may not always have an adequate supply of water to sell to us. Wholesale water suppliers may increase their prices for water delivered to us based on factors that affect their operating costs. Purchased water rate increases are beyond our control.

GSWC has implemented a modified supply cost balancing account ("MCBA") to track and recover costs from supply mix changes and rate changes by wholesale suppliers, as authorized by the CPUC. However, cash flows from operations can be significantly affected since much of the balance we recognize in the MCBA is collected from or refunded to customers primarily through surcharges or surcredits, respectively, generally over twelve to eighteen month periods.

Our liquidity and earnings may be adversely affected by maintenance costs

Some of our infrastructure in California is more than fifty years old. We have experienced leaks and mechanical problems in some of these older systems. In addition, well and pump maintenance expenses are affected by labor and material costs and more stringent environmental regulations. These costs can increase substantially and unexpectedly.

We include estimated increases in maintenance costs for future years in each general rate case filed by GSWC for possible recovery. We may not recover overages from amounts estimated in rates.

Our liquidity and earnings may be adversely affected by our conservation efforts

Our water utility business is heavily dependent upon revenue generated from rates charged to our residential customers based on the volume of water used. The rates we charge for water are regulated by the CPUC and may not be adequately adjusted to reflect changes in demand. Declining usage also negatively impacts our long-term operating revenues if we are unable to secure rate increases or if growth in the residential customer base does not occur to the extent necessary to offset per-customer residential-usage decline.

Conservation by all customer classes at GSWC is a top priority. However, customer conservation will result in lower volumes of water sold. We may experience a decline in per-residential-customer water usage due to factors such as:

- * conservation efforts to reduce costs;
- * drought conditions resulting in additional water conservation;
- * the use of more efficient household fixtures and appliances by consumers to save water;
- * voluntary or mandatory changes in landscaping and irrigation patterns;
- * recycling of water by our customers; and
- * regulation of groundwater rights.

These types of changes may result in permanent decreases in demand even if our water supplies are sufficient to meet higher levels of demand after a drought ends. In addition, governmental restrictions on water usage during drought conditions may result in a decreased demand for our water, even if our sources of supply are sufficient to serve our customers during such drought conditions.

We implemented a CPUC-approved water-revenue adjustment mechanism ("WRAM") at GSWC, which has the effect of reducing the adverse impact of our customers' conservation efforts on revenues. However, cash flows from operations can be significantly affected since much of the balance we recognize in the WRAM account is collected from or refunded to customers generally over a twelve, eighteen or thirty-six month period.

Our earnings may be affected by weather during different seasons

The demand for water and electricity varies by season. For instance, there can be a higher level of water consumption during the third quarter of each year when weather in California tends to be hot and dry. During unusually wet weather, our customers generally use less water. The CPUC-approved WRAM helps mitigate fluctuations in revenues due to changes in water consumption by our customers in California.

The demand for electricity in our electric customer service area is greatly affected by winter snow levels. An increase in winter snow levels reduces the use of snowmaking machines at ski resorts in the Big Bear area and, as a result, reduces our electric revenues. Likewise, unseasonably warm weather during a skiing season may result in temperatures too high for snowmaking conditions, which also reduces our electric revenues. GSWC has implemented a CPUC-approved base-revenue-requirement adjustment mechanism for our electric business which helps mitigate fluctuations in the revenues of our electric business due to changes in the amount of electricity used by GSWC's electric customers.

Our liquidity may be adversely affected by increases in electricity and natural gas prices in California

We generally purchase most of the electric energy sold to customers in our electric customer service area from others under purchased power contracts. In addition to purchased power contracts, we purchase additional energy from the spot market to meet peak demand and following the expiration of purchased power contracts if there are delays in obtaining CPUC authorization of new purchase power contracts. We may sell surplus power to the spot market during times of reduced energy demand. As a result, our cash flows may be affected by increases in spot market prices of electricity purchased and decreases in spot market prices for electricity sold. However, GSWC has implemented supply-cost balancing accounts, as approved by the CPUC, to mitigate fluctuations in supply costs. We also operate a natural-gas-fueled 8.4 megawatt generator in our electric service area.

Unexpected generator downtime or a failure to perform by any of the counterparties to our electric and natural gas purchase contracts could further increase our exposure to fluctuating natural gas and electricity prices.

Changes in electricity prices also affect the unrealized gains and losses on our block forward purchased power contracts that qualify as derivative instruments since we adjust the asset or liability on these contracts to reflect the fair market value of the contracts at the end of each month. The CPUC has authorized us to establish a memorandum account to track the changes in the fair market value of our purchased power contracts. As a result, unrealized gains and losses on these types of purchased power contracts do not impact earnings.

We may not be able to procure sufficient renewable energy resources to comply with CPUC rules

We are required to procure a portion of our electricity from renewable energy resources to meet the CPUC's renewable procurement requirements. We have an agreement with a third party to purchase renewable energy credits which we believe allows us to meet these requirements through 2023. In the event that the third party fails to perform in accordance with the terms of the agreement, we may not be able to obtain sufficient resources to meet the renewable procurement requirements. We may be subject to fines and penalties by the CPUC if it determines that we are not in compliance with the renewable resource procurement rules.

Our assets are subject to condemnation

Municipalities and other governmental subdivisions may, in certain circumstances, seek to acquire certain of our assets through eminent domain proceedings. It is generally our practice to contest these proceedings, which may be costly and may temporarily divert the attention of management from the operation of our business. If a municipality or other governmental subdivision succeeds in acquiring our assets, there is a risk that we will not receive adequate compensation for the assets

acquired or be able to recover all charges associated with the condemnation of these assets. In addition, we would no longer be entitled to any portion of revenue generated from the use of such assets.

Our costs of obtaining and complying with the terms of franchise agreements are increasing

Cities and counties in which GSWC operates have granted GSWC franchises to construct, maintain and use pipes and appurtenances in public streets and rights of way. The costs of obtaining, renewing and complying with the terms of these franchise agreements have been increasing as cities and counties attempt to regulate GSWC's operations within the boundaries of the city or unincorporated areas of the counties in which GSWC operates. Cities and counties have also been attempting to impose new fees on GSWC's operations, including pipeline abandonment fees and road-cut or other types of capital improvement fees. At the same time, there is increasing opposition from consumer groups to rate increases that may be necessary to compensate GSWC for the increased costs of regulation by local governments. These trends may adversely affect GSWC's ability to recover its costs of providing water service in rates and to efficiently manage capital expenditures and operating and maintenance expenses within CPUC authorized levels.

The generation, transmission and distribution of electricity are dangerous and involve inherent risks of damage to private property and injury to employees and the general public

Electricity is dangerous for employees and the general public should they come in contact with electrical current or equipment, including through downed power lines or equipment malfunctions. Injuries and property damage caused by such events may subject GSWC to significant liabilities that may not be covered or fully covered by insurance. Additionally, the CPUC has delegated to its staff the authority to issue citations, which carry a fine of \$50,000 per-violation per day, to electric utilities subject to its jurisdiction for violations of safety rules found in statutes, regulations, and the General Orders of the CPUC which could also materially affect GSWC's liquidity and results of operations.

Additional Risks Associated with our Contracted Services Operations

We derive revenues from contract operations primarily from the operation and maintenance of water and/or wastewater systems at military bases and the construction of water and wastewater infrastructure on these bases (including renewal and replacement of these systems). As a result, these operations are subject to risks that are different from those of our public utility operations.

Our 50-year contracts for servicing military bases create certain risks that are different from our public utility operations

We have entered into contracts to provide water and/or wastewater services at military bases pursuant to 50-year contracts, subject to termination, in whole or in part, for the convenience of the U.S. government. In addition, the U.S. government may stop work under the terms of one or more of the contracts, delay performance of our obligations under the contracts or modify the contracts at its convenience.

Our contract pricing was based on a number of assumptions, including assumptions about prices and availability of labor, equipment and materials. We may be unable to recover all costs if any of these assumptions are inaccurate or if all costs incurred in connection with performing the work were not considered. Our contracts are also subject to periodic price adjustments at the time of price redetermination, in connection with economic price adjustments or requests for equitable adjustment, or other changes permitted by the terms of the contracts. The contract price for each of these contracts is subject to either (i) redetermination every three years following the initial two years of the contracts or (ii) economic price adjustments on an annual basis. Prices are also subject to equitable adjustment based upon changes in circumstances, laws or regulations and service-requirement changes with respect to wages and fringe benefits to the extent provided in each of the contracts.

We are required to record all costs under these types of contracts as they are incurred. As a result, we may record losses associated with unanticipated conditions, higher than anticipated infrastructure levels and emergency work at the time such expenses occur. We recognize additional revenue for such work as, and to the extent that, our price redeterminations, economic price adjustments and/or requests for equitable adjustments are approved. Delays in obtaining approval of price redeterminations, economic price adjustments and/or equitable adjustments can negatively impact our results of operations and cash flows.

Certain payments under these contracts are subject to appropriations by Congress. We may experience delays in receiving payment or delays in redetermination of prices or other price adjustments due to canceled or delayed appropriations specific to our projects or reductions in government spending for the military generally or military-base operations specifically.

Appropriations and the timing of payment may be influenced by, among other things, the state of the economy, competing political priorities, budget constraints, the timing and amount of tax receipts and the overall level of government expenditures for the military generally or military-base operations specifically.

Management also reviews goodwill for impairment at least annually. ASUS has \$1.1 million of goodwill which may be at risk for potential impairment if requested price redeterminations, economic price adjustments and/or equitable adjustments are not granted.

Risks associated with the collection of wastewater are different from those of our water distribution operations

The wastewater-collection-system operations of our subsidiaries providing wastewater services on military bases are subject to substantial regulation and involve significant environmental risks. If collection or sewage systems fail, overflow or do not operate properly, untreated wastewater or other contaminants could spill onto nearby properties or into nearby streams and rivers, causing damage to persons or property, injury to aquatic life and economic damages. The cost of addressing such damages may not be recoverable. This risk is most acute during periods of substantial rainfall or flooding, which are common causes of sewer overflows and system failures. Liabilities resulting from such damage could adversely and materially affect our business, results of operations and financial condition. In the event that we are deemed liable for any damage caused by overflows, our losses may not be recoverable under our contracts with the U.S. government or covered by insurance policies. We may also find it difficult to secure insurance for this business in the future at acceptable rates.

We may have responsibility for water quality at the military bases we serve

While it is the responsibility of the U.S. government to provide the source water supply to meet the Military Utility Privatization Subsidiaries' water distribution system requirements under their contracts, the Military Utility Privatization Subsidiaries, as the water system permit holders for most of the bases they serve, are responsible for ensuring the continued compliance of the provided source of supply with all Federal, State and local regulations. We believe, however, that the terms of the contracts between the Military Utility Privatization Subsidiaries and the U.S. government provide the opportunity for us to recover costs incurred in the treatment or remediation of any quality issue that arises from the source of water supply.

Our contracts for the construction of infrastructure improvements on military bases create risks that are different from those of our operations and maintenance activities

We have entered into contract modifications with the U.S. government and agreements with third parties for the construction of new water and/or wastewater infrastructure at the military bases on which we operate. Most of these contracts are firm fixed-price contracts. Under firm fixed-price contracts, we will benefit from cost savings, but are generally unable (except for changes in scope or circumstances approved by the U.S. government or third party) to recover any cost overruns to the approved contract price. Under most circumstances, the U.S. government or third party has approved increased-cost change orders due to changes in scope of work performed.

We generally recognize revenues from these types of contracts using the percentage-of-completion method of accounting. This accounting practice results in our recognizing contract revenues and earnings ratably over the contract term in proportion to contract costs incurred or the physical completion of the construction projects. The earnings or losses recognized on individual contracts are based on periodic estimates of contract revenues, costs and profitability as these construction projects progress.

We establish prices for these types of firm fixed-price contracts and the overall 50-year contracts taken as a whole, based, in part, on cost estimates that are subject to a number of assumptions, including assumptions regarding future economic conditions. If these estimates prove inaccurate or circumstances change, cost overruns could have a material adverse effect on our contracted business operations and results of operations.

We may be adversely affected by disputes with the U.S. government regarding our performance of contracted services on military bases

We are periodically audited or reviewed by the Defense Contract Auditing Agency ("DCAA") and/or the Defense Contract Management Agency ("DCMA") for compliance with federal acquisition regulations, cost-accounting standards and other laws, regulations and standards that are not applicable to the operations of GSWC. During the course of these audits/reviews, the DCAA or DCMA may question our incurred project costs or the manner in which we have accounted for such costs and recommend to our U.S. government administrative contracting officer that such costs be disallowed.

If there is a dispute with the U.S. government regarding performance under these contracts or the amounts owed to us, the U.S. government may delay, reject or withhold payment, delay price redeterminations or assert its right to offset damages against amounts owed to us. If we are unable to collect amounts owed to us on a timely basis or the U.S. government asserts its offset rights, profits and cash flows could be adversely affected.

If we fail to comply with the terms of one or more of our U.S. government contracts, other agreements with the U.S. government or U.S. government statutes and regulations, we could also be suspended or barred from future U.S. government contracts for a period of time and be subject to possible damages, fines and penalties as well as damage to our reputation in the water and wastewater industry.

We depend, to some extent, upon subcontractors to assist us in the performance of contracted services on military bases

We rely, to some extent, on subcontractors to assist us in the operation and maintenance of the water and wastewater systems at military bases. The failure of any of these subcontractors to perform services for us in accordance with the terms of our contracts with the U.S. government could result in the termination of our contract to provide water and/or wastewater services at the affected base(s), a loss of revenues or increases in costs to correct a subcontractor's performance failures.

We are also required to make a good faith effort to achieve our small business subcontracting plan goals pursuant to U.S. government regulations. If we fail to use good faith efforts to meet these goals, the U.S. government may assess damages against us at the end of the contract. The U.S. government has the right to offset claimed damages against any amounts owed to us.

We also rely on third-party manufacturers, as well as third-party subcontractors, to complete our construction projects. To the extent that we cannot engage subcontractors or acquire equipment or materials, our ability to complete a project in a timely fashion or at a profit may be impaired. If the amount of costs we incur for these projects exceeds the amount we have estimated in our bid, we could experience reduced profits or losses in the performance of these contracts. In addition, if a subcontractor or manufacturer is unable to deliver its services, equipment or materials according to the negotiated terms for any reason, including the deterioration of its financial condition, we may be required to purchase the services, equipment or materials from another source at a higher price. This may reduce the profit to be realized or result in a loss on a project for which the services, equipment or materials were needed.

If these subcontractors fail to perform services to be provided to us or fail to provide us with the proper equipment or materials, we may be penalized for their failure to perform; however, our contracts with these subcontractors include certain protective provisions, which may include the assessment of liquidated damages. We mitigate these risks by requiring our subcontractors, as appropriate, to obtain performance bonds and to compensate us for any penalties we may be required to pay as a result of their failure to perform.

Our earnings may be affected, to some extent, by weather during different seasons

Seasonal weather conditions, such as hurricanes, heavy rainfall or significant winter storms, occasionally cause temporary office closures and/or result in temporary halts to construction activity at military bases. To the extent that our construction activities are impeded by these events, we will experience a delay in recognizing revenues from these construction projects.

We continue to incur costs associated with the expansion of our contract activities

We continue to incur additional costs in connection with the expansion of our contract operations associated with the preparation of bids for new contract operations on prospective and existing military bases. Our ability to recover these costs and to earn a profit on our contract operations will depend upon the extent to which we are successful in obtaining new contracts and recovering these costs and other costs from new contract revenues.

We face competition for new military privatization contracts

An important part of our growth strategy is the expansion of our contracted services business through new contract awards to serve additional military bases for the U.S. government. ASUS competes with other regulated utilities, municipalities, and other entities for these contracts.

Other Risks

The accuracy of our judgments and estimates about financial and accounting matters will impact our operating results and financial condition

The quality and accuracy of estimates and judgments used have an impact on our operating results and financial condition. If our estimates are not accurate, we will be required to make an adjustment in a future period. We make certain estimates and judgments in preparing our financial statements regarding, among others:

- * timing of recovering WRAM and MCBA regulatory assets;
- * amounts to set aside for uncollectible accounts receivable, inventory obsolescence and uninsured losses;
- * our legal exposure and the appropriate accrual for claims, including general liability and workers' compensation claims;
- * future costs and assumptions for pensions and other post-retirement benefits;
- * regulatory recovery of deferred items; and
- * possible tax uncertainties.

Our business requires significant capital expenditures

The utility business is capital intensive. We spend significant sums of money for additions to, or replacement of, our property, plant and equipment at our water and electric utilities. We obtain funds for these capital projects from operations, contributions by developers and others and advances from developers (which are repaid over a period of time at no interest). We also periodically borrow money or issue equity for these purposes. In addition, we have a syndicated bank credit facility that is partially used for these purposes. We cannot provide assurance that these sources will continue to be adequate or that the cost of funds will remain at levels permitting us to earn a reasonable rate of return.

Our Military Utility Privatization Subsidiaries providing water and wastewater services on military bases also expect to incur significant capital expenditures. To the extent that the U.S. government does not reimburse us for these expenditures as the work is performed or completed, the U.S. government will repay us over time.

We may be adversely impacted by economic conditions

Access to external financing on reasonable terms depends, in part, on conditions in the debt and equity markets. When business and market conditions deteriorate, we may no longer have access to the capital markets on reasonable terms. Our ability to obtain funds is dependent upon our ability to access the capital markets by issuing debt or equity to third parties or obtaining funds from our revolving credit facility. In the event of financial turmoil affecting the banking system and financial markets, consolidation of the financial services industry, significant financial service institution failures or our inability to renew or replace our existing revolving credit facility on favorable terms, it may become necessary for us to seek funds from other sources on less favorable terms.

Market conditions and demographic changes may adversely impact the value of our benefit plan assets and liabilities

Market factors can affect assumptions we use in determining funding requirements with respect to our pension and other postretirement benefit plans. For example, a relatively modest change in our assumptions regarding discount rates can materially affect our calculation of funding requirements. To the extent that market data compels us to reduce the discount rate used in our assumptions, our benefit obligations could materially increase, which could adversely affect our financial position and cash flows. Further, changes in demographics, such as increases in life expectancy assumptions may also increase the funding requirements of our obligations related to the pension and other postretirement benefit plans.

Market conditions also affect the values of the assets that are held in trust to satisfy significant future obligations under our pension and other postretirement benefit plans. These assets are subject to market fluctuations, which may cause investment returns to fall below our projected rates of return. A decline in the market value of our pension and other postretirement benefit plan assets will increase the funding requirements under these plans if future returns on these assets are insufficient to offset the decline in value. Future increases in pension and other postretirement costs as a result of the reduced value of plan assets may not be fully recoverable in rates, and our results of operations and financial position could be

negatively affected. These risks are mitigated to some extent by the two-way pension balancing account authorized by the CPUC which permits us to track differences between forecasted annual pension expense adopted in rates and actual pension expenses for future recovery or refund to customers.

Payment of our debt may be accelerated if we fail to comply with restrictive covenants in our debt agreements

Our failure to comply with restrictive covenants in our debt agreements could result in an event of default. If the default is not cured or waived, we may be required to repay or refinance this debt before it becomes due. Even if we are able to obtain waivers from our creditors, we may only be able to do so on unfavorable terms.

The price of our Common Shares may be volatile and may be affected by market conditions beyond our control

The trading price of our Common Shares may fluctuate in the future because of the volatility of the stock market and a variety of other factors, many of which are beyond our control. Factors that could cause fluctuations in the trading price of our Common Shares include: regulatory developments; general economic conditions and trends; price and volume fluctuations in the overall stock market from time to time; actual or anticipated changes or fluctuations in our results of operations; actual or anticipated changes in the expectations of investors or securities analysts; actual or anticipated developments in other utilities' businesses or the competitive landscape generally; litigation involving us or our industry; and major catastrophic events or sales of large blocks of our stock.

AWR is a holding company that depends on cash flow from its subsidiaries to meet its financial obligations and to pay dividends on its Common Shares

As a holding company, our subsidiaries conduct substantially all operations and our only significant assets are investments in our subsidiaries. This means that we are dependent on distributions of funds from our subsidiaries to meet our debt service obligations and to pay dividends on our Common Shares.

Our subsidiaries are separate and distinct legal entities and generally have no obligation to pay any amounts due on our credit facility. Our subsidiaries only pay dividends if and when declared by the subsidiary board. Moreover, GSWC is obligated to give first priority to its own capital requirements and to maintain a capital structure consistent with that determined to be reasonable by the CPUC in its most recent decision on capital structure in order that customers not be adversely affected by the holding company structure. Furthermore, our right to receive cash or other assets in the unlikely event of liquidation or reorganization of any of our subsidiaries is generally subject to the prior claims of creditors of that subsidiary. If we are unable to obtain funds from a subsidiary in a timely manner, we may be unable to meet our financial obligations, make additional investments or pay dividends.

Failure to attract, retain, train, motivate, develop and transition key employees could adversely affect our business

In order to be successful, we must attract, retain, train, motivate, and develop key employees, including those in managerial, operational, financial, business-development and information-technology support positions. Our regulated business and contracted services operations are complex. Attracting and retaining high quality staff allows us to minimize the cost of providing quality service. In order to attract and retain key employees in a competitive marketplace, we must provide a competitive compensation package and be able to effectively recruit qualified candidates. The failure to successfully hire key employees or the loss of a material number of key employees could have a significant impact on the quality of our operations in the short term. Further, changes in our management team may be disruptive to our business, and any failure to successfully transition key new hires or promoted employees could adversely affect our business and results of operations.

We must successfully maintain and/or upgrade our information technology systems as we are increasingly dependent on the continuous and reliable operation of these systems

We rely on various information technology systems to manage our operations. Such systems require periodic modifications, upgrades and/or replacement, which subject us to inherent costs and risks including potential disruption of our internal control structure, substantial capital expenditures, additional administration and operating expenses, retention of sufficiently skilled personnel to implement and operate the new systems, and other risks and costs of delays or difficulties in transitioning to new systems or of integrating new systems into our current systems. In addition, the difficulties with implementing new technology systems may cause disruptions in our business operations and have an adverse effect on our business and operations, if not anticipated and appropriately mitigated.

We rely on our computer, information and communications technology systems in connection with the operation of our business, especially with respect to customer service and billing, accounting and the monitoring and operation of our treatment, storage and pumping facilities. Our computer and communications systems and operations could be damaged or interrupted by weather, natural disasters, telecommunications failures or acts of war or terrorism or similar events or disruptions. Any of these or other events could cause system interruption, delays and loss of critical data, or delay or prevent operations and adversely affect our financial results.

Security risks, data protection breaches and cyber-attacks could disrupt our internal operations, and any such disruption could increase our expenses, damage our reputation and adversely affect our stock price

There have been an increasing number of cyber-attacks on companies around the world, which have caused operational failures or compromised sensitive corporate or customer data. These attacks have occurred over the internet, through malware, viruses or attachments to e-mails or through persons inside the organization or with access to systems inside the organization. Although we do not believe that our systems are at a materially greater risk of cyber security attacks than other similar organizations, our information technology systems remain vulnerable to damage or interruption from:

- * computer viruses;
- * malware;
- * hacking; and
- * denial of service actions.

We have implemented security measures and will continue to devote significant resources to address any security vulnerabilities in an effort to prevent cyber-attacks. Despite our efforts, we cannot be assured that a cyber-attack will not cause water, wastewater or electric system problems, disrupt service to our customers, compromise important data or systems or result in unintended release of customer or employee information. Moreover, if a computer security breach affects our systems or results in the unauthorized release of sensitive data, our reputation could be materially damaged. We could also be exposed to a risk of loss or litigation and possible liability. In addition, pursuant to U.S. government regulations regarding cyber-security of government contractors, we might be subject to fines, penalties or other actions, including debarment, with respect to current contracts or with respect to future contract opportunities.

Our operations are geographically concentrated in California

Although we operate water and wastewater facilities in a number of states, our water and electric operations are concentrated in California, particularly Southern California. As a result, our financial results are largely subject to political, water supply, labor, utility cost and regulatory risks, economic conditions, natural disasters and other risks affecting California.

We operate in areas subject to natural disasters

We operate in areas that are prone to earthquakes, fires, mudslides, hurricanes, tornadoes, flooding or other natural disasters. While we maintain insurance policies to help reduce our financial exposure, a significant seismic event in Southern California, where GSWC's operations are concentrated, or other natural disasters in any of the areas that we serve could adversely impact our ability to deliver water and electricity or provide wastewater service and adversely affect our costs of operations. With respect to GSWC, the CPUC has historically allowed utilities to establish a catastrophic event memorandum account to potentially recover such costs.

Our operations may be the target of terrorist activities

Terrorists could seek to disrupt service to our customers by targeting our assets. We have invested in additional security for facilities throughout our regulated service areas to mitigate the risks of terrorist activities. We also may be prevented from providing water and/or wastewater services at the military bases we serve in times of military crisis affecting these bases.

The final determination of our income tax liability may be materially different from our income tax provision

Significant judgment is required in determining our provision for income taxes. Our calculation of the provision for income taxes is subject to our interpretation of applicable business tax laws in the jurisdictions in which we file. In addition, our income tax returns are subject to periodic examination by the Internal Revenue Service and other taxing authorities.

In December 2014, the Company changed its tax method of accounting to permit the expensing of qualifying utility asset improvement costs that were previously being capitalized and depreciated for tax purposes. As a result of the change, which included a cumulative adjustment for 2013 and prior years, the Company deducted a significant amount of asset costs that consisted primarily of water mains and connections. Our determination of costs that qualify as a capital asset versus an immediate tax deduction for utility asset improvements is subject to subsequent adjustment arising from review by taxing authorities, and may impact the deductions that have been taken on recently filed income tax returns. Although we believe our income tax estimates are appropriate, there is no assurance that the final determination of our current taxes payable will not be materially different, either higher or lower, from the amounts reflected in our financial statements. In the event we are assessed additional income taxes, our financial condition and cash flows could be adversely affected.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Water Properties

As of December 31, 2016, GSWC’s physical properties consisted of water transmission and distribution systems which included 2,825 miles of pipeline together with services, meters and fire hydrants and approximately 425 parcels of land, generally less than one acre each, on which are located wells, pumping plants, reservoirs and other water utility facilities, including four surface water treatment plants. GSWC also has franchises, easements and other rights of way for the purpose of accessing wells and tanks and constructing and using pipes and appurtenances for transmitting and distributing water. All of GSWC’s properties are located in California.

As of December 31, 2016, GSWC owned 247 wells, of which 203 are active with an aggregate production capacity of approximately 208 million gallons per day. GSWC has 64 connections to the water distribution facilities of the MWD and other municipal water agencies. GSWC’s storage reservoirs and tanks have an aggregate capacity of approximately 115.8 million gallons. GSWC owns no dams. The following table provides information regarding the water utility plant of GSWC:

Pumps		Distribution Facilities			Reservoirs	
Well	Booster	Mains*	Services	Hydrants	Tanks	Capacity*
247	399	2,825	261,059	26,065	147	115,765 (1)

* Reservoir capacity is measured in thousands of gallons. Mains are in miles.

(1) GSWC has additional capacity in its Bay Point system through an exclusive capacity right to use 4.4 million gallons from a treatment plant owned by the Contra Costa Water District. GSWC also has additional reservoir capacity through an exclusive right to use an eight-million-gallon reservoir, one-half of another eight-million-gallon reservoir, and one-half of a treatment plant’s capacity, all owned by the Three Valleys Municipal Water District, to serve the cities of Claremont and San Dimas.

Electric Properties

GSWC’s electric properties are located in the Big Bear area of San Bernardino County, California. As of December 31, 2016, GSWC owned and operated approximately 87.8 miles of overhead 34.5 kilovolt (kv) transmission lines, 2.7 miles of underground 34.5 kv transmission lines, 488.6 miles of 4.16 kv or 2.4 kv distribution lines, 89.1 miles of underground cable, 13 sub-stations and a natural gas-fueled 8.4 MW peaking generation facility. GSWC also has franchises, easements and other rights of way for the purpose of constructing and using poles, wires and other appurtenances for transmitting electricity.

Adjudicated and Other Water Rights

GSWC owns groundwater and surface water rights in California. Groundwater rights are further subject to classification as either adjudicated or unadjudicated rights. Adjudicated rights have been subjected to comprehensive litigation in the courts, are typically quantified and are actively managed for optimization and sustainability of the resource. Unadjudicated rights are subject to further regulation by the State Water Resources Control Board (“SWRCB”) and the California Department of Water Resources. Surface water rights are quantified and managed by the State Water Resources Control Board, unless the surface water rights originated prior to 1914. As of December 31, 2016, GSWC had adjudicated groundwater rights and surface water rights of 74,332 and 11,335 acre feet per year, respectively. GSWC also has a number of unadjudicated groundwater rights, which have not been quantified, but are typically measured by historical usage.

Office Buildings

GSWC owns its general headquarters facilities in San Dimas, California. GSWC also owns and leases certain facilities throughout California that house district and customer service offices. ASUS leases office facilities in Georgia, Virginia and North Carolina. ASUS terminated an office lease in California in January 2017. TUS and ECUS rent temporary service center facilities in Maryland and Florida, respectively, pending the completion of facilities being or to be constructed at those locations. FBWS has a ten-year, renewable, no-cost license for use of space in a U.S. government building at Fort Bliss as a service center. PSUS, ODUS and ONUS own service centers in South Carolina, Virginia and North Carolina, respectively.

Mortgage and Other Liens

As of December 31, 2016, neither AWR, GSWC, nor ASUS, or any of its subsidiaries, had any mortgage debt or liens securing indebtedness outstanding.

Under the terms of certain debt instruments, AWR and GSWC are prohibited from issuing any secured debt, without providing equal and ratable security to the holders of this existing debt.

Condemnation of Properties

The laws of the state of California provide for the acquisition of public utility property by governmental agencies through their power of eminent domain, also known as condemnation, where doing so is necessary and in the public interest. In addition, these laws provide that the owner of utility property (i) may contest whether the condemnation is actually necessary and in the public interest, and (ii) is entitled to receive the fair market value of its property if the property is ultimately taken.

Environmental Clean-Up and Remediation of Properties

GSWC has been involved in environmental remediation and clean-up at a plant site ("Chadron Plant") that contained an underground storage tank which was used to store gasoline for its vehicles. This tank was removed from the ground in July 1990 along with the dispenser and ancillary piping. Since then, GSWC has been involved in various remediation activities at this site.

GSWC has accrued an estimated liability which includes costs for two years of continued activities of cleanup and monitoring, and site-closure-related activities. The ultimate cost may vary as there are many unknowns in remediation of underground gasoline spills and this is an estimate based on currently available information. Management believes it is probable that the estimated additional costs will be approved in rate base by the CPUC.

Item 3. Legal Proceedings

On December 9, 2014, the City of Claremont filed an eminent domain lawsuit in the County of Los Angeles Superior Court against GSWC (*City of Claremont v. Golden State Water Company*, Case No. BC 566125) to acquire GSWC's Claremont system which serves the City of Claremont and parts of surrounding communities. The trial to determine Claremont's right to seize the water system by eminent domain concluded in August 2016. On December 9, 2016, the presiding judge entered the decision rejecting Claremont's attempt to take over GSWC's Claremont water system. On February 2, 2017, the City of Claremont filed an appeal to the decision. At this time, Registrant is unable predict the final outcome of the appeal.

On May 12, 2016, Casitas Municipal Water District filed an eminent domain lawsuit in Ventura County Superior Court against GSWC (*Casitas Municipal Water District v. Golden State Water Company*, Case No. 56-2016-00481628-CU-EI-VTA) to acquire the property and assets of GSWC located in its Ojai service area. The lawsuit included additional causes of action related to claims of potential damages resulting from any delay caused by GSWC seeking relief in the prior action regarding the use of Mello-Roos funds for such a taking of property. At this time, management cannot predict the outcome of this eminent domain proceeding or potential appeal by FLOW.

Registrant is subject to ordinary routine litigation incidental to its business. Management believes that rate recovery, proper insurance coverage and reserves are in place to insure against property, general liability and workers' compensation claims incurred in the ordinary course of business. Registrant is unable to predict an estimate of the loss, if any, resulting from any pending suits or administrative proceedings.

Item 4. Mine Safety Disclosure

Not applicable.

PART II

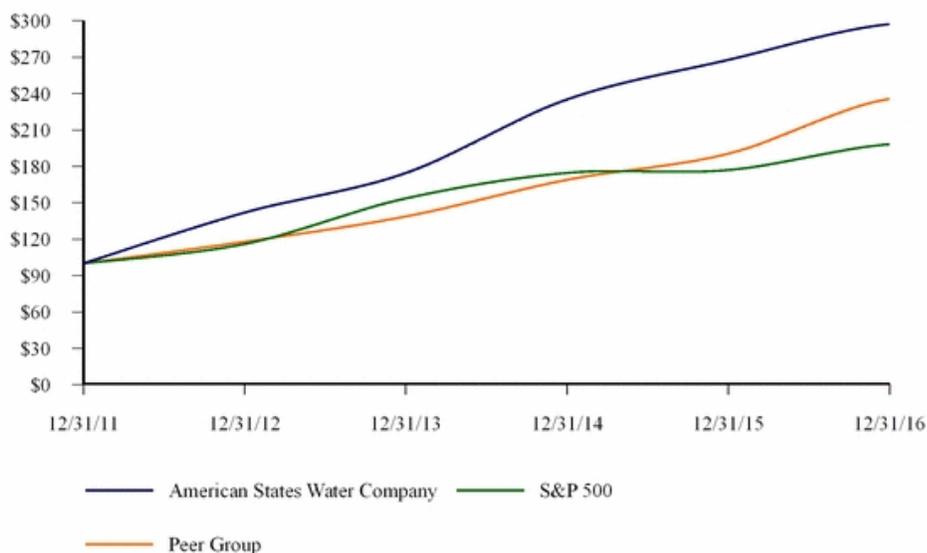
Item 5. Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Stock Performance Graph

The graph below compares the cumulative 5-year total return provided shareholders on American States Water Company’s Common Shares relative to the cumulative total returns of the S&P 500 index and a customized peer group of eight companies. The eight companies included in the Company’s customized peer group are: American Water Works Company Inc., Aqua America Inc., Artesian Resources Corporation, California Water Service Group, Connecticut Water Service Inc., Middlesex Water Company, York Water Company and SJW Corp.

An investment of \$100 (with reinvestment of all dividends) is assumed to have been made in our Common Shares, and in the common stock in the index and in the peer group on December 31, 2011. Relative performance is tracked through December 31, 2016.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*
among American States Water Company, the S&P 500 Index,
and a Peer Group



*\$100 invested on December 31, 2011 in stock or index, including reinvestment of dividends. Fiscal year ending December 31.

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	12/2011	12/2012	12/2013	12/2014	12/2015	12/2016
American States Water Company	\$ 100.00	\$ 141.85	\$ 174.54	\$ 235.10	\$ 267.80	\$ 297.28
S&P 500	\$ 100.00	\$ 116.00	\$ 153.58	\$ 174.60	\$ 177.01	\$ 198.18
Peer Group	\$ 100.00	\$ 117.86	\$ 138.72	\$ 168.88	\$ 190.48	\$ 235.63

The stock price performance included in this graph is not necessarily indicative of future stock price performance.

Market Information Relating to Common Shares

Common Shares of American States Water Company are traded on the New York Stock Exchange (“NYSE”) under the symbol “AWR”. The intra-day high and low NYSE prices on the Common Shares for each quarter during the past two years, were:

	Stock Prices	
	High	Low
2016		
First Quarter	\$ 47.24	\$ 38.25
Second Quarter	\$ 43.83	\$ 37.28
Third Quarter	\$ 44.46	\$ 37.51
Fourth Quarter	\$ 46.39	\$ 37.47
2015		
First Quarter	\$ 41.73	\$ 36.86
Second Quarter	\$ 40.70	\$ 35.87
Third Quarter	\$ 41.84	\$ 35.80
Fourth Quarter	\$ 44.14	\$ 39.67

The closing price of the Common Shares of American States Water Company on the NYSE on February 21, 2017 was \$44.54.

Approximate Number of Holders of Common Shares

As of February 21, 2017, there were 2,400 holders of record of the 36,586,831 outstanding Common Shares of American States Water Company. AWR owns all of the outstanding Common Shares of GSWC and ASUS. ASUS owns all of the outstanding stock of the Military Utility Privatization Subsidiaries.

Frequency and Amount of Any Dividends Declared and Dividend Restrictions

For the last two years, AWR has paid dividends on its Common Shares on or about March 1, June 1, September 1 and December 1. The following table lists the amounts of dividends paid on Common Shares of American States Water Company:

	2016	2015
First Quarter	\$ 0.224	\$ 0.213
Second Quarter	\$ 0.224	\$ 0.213
Third Quarter	\$ 0.224	\$ 0.224
Fourth Quarter	\$ 0.242	\$ 0.224
Total	\$ 0.914	\$ 0.874

AWR’s ability to pay dividends is subject to the requirement in its \$150.0 million revolving credit facility to maintain compliance with all covenants described in footnote (14) to the table in the section entitled “*Contractual Obligations, Commitments and Off Balance Sheet Arrangements*” included in Part II, Item 7, in Management’s Discussion and Analysis of Financial Condition and Results of Operation. GSWC’s maximum ability to pay dividends is restricted by certain Note Agreements to the sum of \$21.0 million plus 100% of consolidated net income from certain dates plus the aggregate net cash proceeds received from capital stock offerings or other instruments convertible into capital stock from various dates. Under the most restrictive of the Note Agreements, \$374.8 million was available from GSWC to pay dividends to AWR as of December 31, 2016. GSWC is also prohibited under the terms of senior notes from paying dividends if, after giving effect to the dividend, its total indebtedness to capitalization ratio (as defined) would be more than 0.6667-to-1. GSWC would have to issue additional debt of \$500.7 million to invoke this covenant as of December 31, 2016.

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Under California law, AWR, GSWC and ASUS are each permitted to distribute dividends to its shareholders and repurchase its shares so long as the Board of Directors determines, in good faith, that either: (i) the value of the corporation's assets equals or exceeds the sum of its total liabilities immediately after the dividend, or (ii) its retained earnings equals or exceeds the amount of the distribution. Under the least restrictive of the California tests, approximately \$247.1 million was available to pay dividends to AWR's common shareholders and repurchase shares from AWR's common shareholders at December 31, 2016. Approximately \$206.3 million was available for GSWC to pay dividends to AWR at December 31, 2016 and approximately \$57.2 million was available for ASUS to pay dividends to AWR at December 31, 2016. However, ASUS's ability to pay dividends is further subject to the ability of each of its subsidiaries to pay dividends to it, which may, in turn, be restricted by the laws under the states in which the applicable subsidiary was formed.

AWR paid \$33.4 million in dividends to shareholders for the year ended December 31, 2016, as compared to \$32.7 million for the year ended December 31, 2015. GSWC paid dividends of \$25.5 million and \$62.0 million to AWR in 2016 and 2015, respectively. ASUS paid dividends of \$8.3 million to AWR in 2016, and did not pay a dividend in 2015. AWR paid \$72.9 million to repurchase its Common Shares in 2015. No shares were repurchased during 2016 pursuant to a stock repurchase program.

Other Information

The shareholders of AWR have approved the material features of all equity-compensation plans under which AWR directly issues equity securities. AWR did not directly issue any unregistered equity securities during 2016.

The following table provides information about AWR repurchases of its Common Shares during the fourth quarter of 2016:

Period	Total Number of Shares Purchased	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs (1)	Maximum Number of Shares That May Yet Be Purchased under the Plans or Programs (1)(3)
October 1—31, 2016	1,379	\$ 38.79	—	—
November 1—30, 2016	24,545	\$ 39.52	—	—
December 1—31, 2016	5,060	\$ 43.23	—	—
Total	30,984 (2)	\$ 40.09	—	—

- (1) None of the common shares were repurchased pursuant to any publicly announced stock repurchase program.
- (2) Of this amount, 23,800 Common Shares were acquired on the open market for employees pursuant to AWR's 401(k) Plan and the remainder of the Common Shares were acquired on the open market for participants in the Common Share Purchase and Dividend Reinvestment Plan.
- (3) Neither the 401(k) plan nor the Common Share Purchase and Dividend Reinvestment Plan contains a maximum number of common shares that may be purchased in the open market.

Item 6. Selected Financial Data**AMERICAN STATES WATER COMPANY (AWR):**

(in thousands, except per share amounts)	2016	2015	2014	2013	2012
Income Statement Information:					
Total Operating Revenues	\$ 436,087	\$ 458,641	\$ 465,791	\$ 472,077	\$ 466,908
Total Operating Expenses	321,371	340,152	346,746	353,005	355,814
Operating Income	114,716	118,489	119,045	119,072	111,094
Interest Expense	21,992	21,088	21,617	22,415	22,765
Interest Income	757	458	927	707	1,333
Net Income	\$ 59,743	\$ 60,484	\$ 61,058	\$ 62,686	\$ 54,148
Basic Earnings per Common Share (1)	\$ 1.63	\$ 1.61	\$ 1.57	\$ 1.61	\$ 1.42
Fully Diluted Earnings per Common Share (1)	\$ 1.62	\$ 1.60	\$ 1.57	\$ 1.61	\$ 1.41
Average Shares Outstanding	36,552	37,389	38,658	38,639	37,998
Average number of Diluted Shares Outstanding	36,750	37,614	38,880	38,869	38,262
Dividends paid per Common Share	\$ 0.914	\$ 0.874	\$ 0.831	\$ 0.760	\$ 0.635
Balance Sheet Information:					
Total Assets (2) (3)	\$ 1,470,493	\$ 1,343,959	\$ 1,373,316	\$ 1,305,041	\$ 1,275,404
Common Shareholders' Equity	494,297	465,945	506,801	492,404	454,579
Long-Term Debt (3)	320,981	320,900	320,816	320,937	326,924
Total Capitalization	\$ 815,278	\$ 786,845	\$ 827,617	\$ 813,341	\$ 781,503

GOLDEN STATE WATER COMPANY (GSWC):

(in thousands)	2016	2015	2014	2013	2012
Income Statement Information:					
Total Operating Revenues	\$ 338,702	\$ 364,550	\$ 361,059	\$ 358,540	\$ 342,931
Total Operating Expenses	242,883	264,141	261,317	256,197	256,326
Operating Income	95,819	100,409	99,742	102,343	86,605
Interest Expense	21,782	20,998	21,524	22,287	22,609
Interest Income	749	440	894	615	1,293
Net Income	\$ 46,969	\$ 47,591	\$ 47,857	\$ 48,642	\$ 39,220
Balance Sheet Information:					
Total Assets (2) (3)	\$ 1,384,178	\$ 1,271,879	\$ 1,277,392	\$ 1,228,239	\$ 1,208,513
Common Shareholder's Equity	446,770	423,730	435,190	437,613	416,257
Long-Term Debt (3)	320,981	320,900	320,816	320,937	326,924
Total Capitalization	\$ 767,751	\$ 744,630	\$ 756,006	\$ 758,550	\$ 743,181

(1) On September 3, 2013, a two-for-one stock split became effective. The number of shares outstanding, and basic and diluted earnings per share ("EPS") have been restated for all periods presented above to reflect the stock split.

(2) Registrant adopted Accounting Standards Update 2015-17, *Balance Sheet Classification of Deferred Taxes*, as of December 31, 2015 on a prospective basis, whereby all deferred tax assets and liabilities are classified as noncurrent on the Registrant's balance sheet. Prior periods were not retrospectively adjusted.

(3) Registrant adopted Accounting Standard Update 2015-03, *Simplifying the Presentation of Debt Issuance Costs* as of December 31, 2016, whereby debt issuance costs and redemption premiums are presented as a direct reduction from the carrying value of the associated debt rather than as an asset. Total Assets and Long-Term Debt have been restated for all periods presented above.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operation

The following discussion and analysis provides information on AWR's consolidated operations and assets, and where necessary, includes specific references to AWR's individual segments and/or its subsidiaries: GSWC and ASUS and its subsidiaries. Included in the following analysis is a discussion of water and electric gross margins. Water and electric gross margins are computed by subtracting total supply costs from total revenues. Registrant uses these gross margins as important measures in evaluating its operating results. Registrant believes these measures are useful internal benchmarks in evaluating the performance of GSWC.

The discussions and tables included in the following analysis also present Registrant's operations in terms of earnings per share by business segment. Registrant believes that the disclosure of earnings per share by business segment provides investors with clarity surrounding the performance of its different services. Registrant reviews these measurements regularly and compares them to historical periods and to its operating budget. However, these measures, which are not presented in accordance with Generally Accepted Accounting Principles ("GAAP"), may not be comparable to similarly titled measures used by other entities and should not be considered as an alternative to operating income or earnings per share, which are determined in accordance with GAAP. A reconciliation of water and electric gross margins to the most directly comparable GAAP measures is included in the table under the section titled "*Operating Expenses: Supply Costs.*" Reconciliations to AWR's diluted earnings per share are included in the discussions under the sections titled "*Summary Results by Segment.*"

Overview

Factors affecting our financial performance are summarized under *Forward-Looking Information*.

Water and Electric Segments:

GSWC's revenues, operating income and cash flows are earned primarily through delivering potable water to homes and businesses in California and the delivery of electricity in the Big Bear area of San Bernardino County, California. Rates charged to GSWC customers are determined by the CPUC. These rates are intended to allow recovery of operating costs and a reasonable rate of return on capital. GSWC plans to continue to seek additional rate increases in future years from the CPUC to recover operating and supply costs and receive reasonable returns on invested capital. Capital expenditures in future years at GSWC are expected to remain at higher levels than depreciation expense. When necessary, GSWC obtains funds from external sources in the capital markets and through bank borrowings.

Water General Rate Case

On December 15, 2016, the CPUC issued a decision on GSWC's water general rate case. GSWC had filed a general rate case application in July 2014 for all of its water regions and the general office to determine new rates for the years 2016 - 2018. The new rates approved by the CPUC were retroactive to January 1, 2016. The 2016 adopted revenues approved in the decision were lower than the adopted levels in 2015, due primarily to reductions in the revenue requirement for: (i) supply costs caused by lower consumption, (ii) depreciation expense resulting from an updated depreciation study, and (iii) other operating expenses due to GSWC's cost containment initiatives. This reduction in water revenues was mostly offset by corresponding decreases in supply costs, depreciation and certain other operating expenses, as discussed later.

Among other things, the decision (i) authorized 87%, or approximately \$250 million, of GSWC's capital requests in customer rates, (ii) allowed only a portion of the executive incentive programs, (iii) approved recovery of previously incurred costs that were being tracked in CPUC-authorized memorandum accounts, which resulted in an approximate \$800,000 reduction to administrative and general expenses for 2016, and (iv) adopted consumption levels, which reflect state-mandated conservation targets that were imposed by the governor of California during the processing of the application. In addition, in accordance with the settlement between GSWC and the CPUC's Office of Ratepayer Advocates, the decision used updated inflation index values to calculate operating expense increases for 2015 and 2016. These inflation indices were lower than the inflation indices used in July 2014 when the water rate case application was filed.

Contracted Services Segment:

ASUS's revenues, operating income and cash flows are earned by providing water and/or wastewater services, including operation and maintenance services and construction of facilities at the water and/or wastewater systems at various military installations, pursuant to 50-year firm fixed-price contracts. The contract price for each of these contracts is subject to prospective price redeterminations or economic price adjustments. Additional revenues generated by contract operations are primarily dependent on new construction activities under contract modifications with the U.S. government or agreements with other third-party prime contractors.

New Privatization Contract Award

On July 12, 2016, ASUS was awarded a 50-year contract by the U.S. government to operate, maintain, and provide construction services for the water and wastewater systems at Eglin Air Force Base located in Florida. The initial value of the contract was estimated at approximately \$510 million over the 50-year period and is subject to annual economic price adjustments. This initial value is also subject to adjustment based on the results of a joint inventory of assets, which is currently underway. ASUS will assume operations at Eglin Air Force Base in the spring of 2017 following the completion of a transition period currently underway.

AWR (parent):Stock Repurchase Programs

In 2014 and 2015, AWR's Board of Directors approved two stock repurchase programs, authorizing AWR to repurchase up to 2.45 million shares of AWR's Common Shares. Both stock repurchase programs were completed in 2015. The repurchase programs were intended to enable AWR to achieve a consolidated shareholders' equity ratio (as a percentage of total capitalization) that is more reflective of the current CPUC-authorized equity ratio for GSWC and an equity ratio for ASUS that is more consistent with firms in the government contracting industry. As a result, AWR repurchased 1.9 million and 545,000 shares of its Common Shares during the years ended December 31, 2015 and 2014, respectively. These repurchases reduced AWR's weighted-average shares outstanding on a diluted basis, which positively benefited earnings per share for the years ended December 31, 2016 and 2015.

Summary Results by Segment

The table below sets forth diluted earnings per share by business segment for AWR's operations:

	Diluted Earnings per Share			
	Year Ended			
	12/31/2016	12/31/2015	CHANGE	
Water	\$ 1.17	\$ 1.19	\$ (0.02)	
Electric	0.10	0.07	0.03	
Contracted services	0.33	0.32	0.01	
AWR (parent)	0.02	0.02	—	
Totals from operations, as reported	\$ 1.62	\$ 1.60	\$ 0.02	

Water Segment:

For the year ended December 31, 2016, fully diluted earnings per share for the water segment decreased by \$0.02 per share to \$1.17 per share, as compared to \$1.19 per share for 2015. The discussion below includes the major items, which impacted the comparability of the two periods.

- The water gross margin decreased by \$9.9 million as a result of lower 2016 adopted revenues authorized by the CPUC's decision in the water GRC, which sets new rates for the years 2016 - 2018. The adopted gross margin in this new rate cycle (starting with 2016) was lower due, in large part, to decreases in adopted expenses including depreciation expense resulting from an updated depreciation study, and many other operating expenses resulting from GSWC's cost containment initiatives. The reduction in the water gross margin was mostly offset by corresponding decreases in depreciation and certain other operating expenses as discussed below. The decrease in the adopted water gross margin was also partially offset by (i) the recognition of a portion of the 2015 WRAM revenues that had previously been deferred as required under the accounting guidance for revenue programs such as the WRAM, (ii) new revenues generated from a water system acquired in October 2015, (iii) higher revenues due to increased consumption as compared to 2015 from customers that are not subject to conservation rates, and (iv) revenues from advice letter capital projects approved by the CPUC in 2015.
- Total operating expenses (excluding supply costs, and condemnation-related costs discussed below) decreased by approximately \$7.6 million. The lower operating expenses, most of which were reflected in the lower gross margin discussed above, included a decrease in (i) depreciation expense resulting from a new depreciation study approved in the water GRC, (ii) allocated costs to the water segment from corporate headquarters as stipulated in the water GRC, and (iii) pension and other operating expenses. In addition, the CPUC's approval for recovery of approximately \$800,000 of previously incurred costs, which were being tracked in CPUC-authorized memorandum accounts, was reflected as a decrease in operating expenses.

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- Negatively impacting the water segment's results was an increase of approximately \$4.0 million in legal and other outside service costs incurred on condemnation-related matters. These costs are expected to continue and will fluctuate from year to year. The Company may receive reimbursement of certain legal and other fees that have been expended in defending against condemnation actions initiated by third parties. However, recovery of such costs is subject to appeals and final resolution of the proceedings involved, which are expected to take in excess of one year to resolve. At this time, the Company is unable to predict when and how much, if any, will be reimbursed.
- Favorably impacting the water segment's results was (i) a decrease in the effective income tax rate for the water segment due to differences between book and taxable income that are treated as flow-through adjustments in accordance with regulatory requirements, and (ii) the cumulative impact of lower Common Shares outstanding resulting from the stock repurchase programs.

Electric Segment:

For the year ended December 31, 2016, diluted earnings from the electric segment increased by \$0.03 per share as compared to the same period in 2015. There was an increase in the electric gross margin resulting from CPUC approval of fourth-year rate increases effective January 1, 2016, as well as CPUC-approved rate increases generated from advice letter filings approved in 2015 and 2016. There was also a decrease in allocated costs to the electric segment from corporate headquarters as stipulated in the water GRC decision and a decrease in expenses associated with the solar-initiative program.

Contracted Services Segment:

For the year ended December 31, 2016, diluted earnings from contracted services were \$0.33 per share, compared to \$0.32 per share for the same period in 2015. The increase in earnings was due to higher contracted services revenue resulting from an increase in ongoing operations and maintenance ("O&M") revenues due to the successful resolution of price redeterminations, economic price adjustments and asset transfers, and an overall increase in construction activity and a higher direct construction margin percentage resulting from improved cost efficiencies. The effect of these favorable variances was partially offset by (i) an increase in the allocation of administrative and general expenses from corporate headquarters to the contracted services segment as stipulated in the water GRC, (ii) an increase in ASUS labor and outside services costs, and (iii) a higher effective income tax rate resulting primarily from an increase in state income taxes as compared to the same period in 2015. State income taxes vary among the jurisdictions in which the contracted services business operates. In addition, there was \$3.0 million of retroactive revenues recorded in 2015 related to periods prior to 2015 resulting from the resolution of several price redeterminations, as compared to approximately \$421,000 in retroactive revenues recorded in 2016 related to 2015.

The following discussion and analysis for the years ended December 31, 2016, 2015 and 2014 provides information on AWR's consolidated operations and assets and, where necessary, includes specific references to AWR's individual segments and subsidiaries: GSWC and ASUS and its subsidiaries.

Consolidated Results of Operations — Years Ended December 31, 2016 and 2015 (amounts in thousands, except per share amounts):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
OPERATING REVENUES				
Water	\$ 302,931	\$ 328,511	\$ (25,580)	-7.8 %
Electric	35,771	36,039	(268)	-0.7 %
Contracted services	97,385	94,091	3,294	3.5 %
Total operating revenues	<u>436,087</u>	<u>458,641</u>	<u>(22,554)</u>	-4.9 %
OPERATING EXPENSES				
Water purchased	64,442	62,726	1,716	2.7 %
Power purchased for pumping	8,663	8,988	(325)	-3.6 %
Groundwater production assessment	14,993	13,648	1,345	9.9 %
Power purchased for resale	10,387	10,395	(8)	-0.1 %
Supply cost balancing accounts	(12,206)	7,785	(19,991)	-256.8 %
Other operation	28,257	28,429	(172)	-0.6 %
Administrative and general	80,994	79,817	1,177	1.5 %
Depreciation and amortization	38,850	42,033	(3,183)	-7.6 %
Maintenance	16,470	16,885	(415)	-2.5 %
Property and other taxes	16,801	16,636	165	1.0 %
ASUS construction	53,720	52,810	910	1.7 %
Total operating expenses	<u>321,371</u>	<u>340,152</u>	<u>(18,781)</u>	-5.5 %
OPERATING INCOME	114,716	118,489	(3,773)	-3.2 %
OTHER INCOME AND EXPENSES				
Interest expense	(21,992)	(21,088)	(904)	4.3 %
Interest income	757	458	299	65.3 %
Other, net	997	356	641	180.1 %
	<u>(20,238)</u>	<u>(20,274)</u>	<u>36</u>	-0.2 %
INCOME FROM OPERATIONS BEFORE INCOME TAX EXPENSE	94,478	98,215	(3,737)	-3.8 %
Income tax expense	<u>34,735</u>	<u>37,731</u>	<u>(2,996)</u>	-7.9 %
NET INCOME	<u>\$ 59,743</u>	<u>\$ 60,484</u>	<u>\$ (741)</u>	-1.2 %
Basic earnings per Common Share	<u>\$ 1.63</u>	<u>\$ 1.61</u>	<u>\$ 0.02</u>	1.2 %
Fully diluted earnings per Common Share	<u>\$ 1.62</u>	<u>\$ 1.60</u>	<u>\$ 0.02</u>	1.3 %

Operating Revenues

General

Registrant relies upon approvals by the CPUC of rate increases to recover operating expenses and to provide for a return on invested and borrowed capital used to fund utility plant for GSWC. Registrant relies on price redeterminations, economic price adjustments and equitable adjustments by the U.S. government in order to recover operating expenses and provide a profit margin for ASUS. If adequate rate relief or price redeterminations and other contract adjustments are not granted in a timely manner, operating revenues and earnings can be negatively impacted. ASUS's earnings are also impacted by the level of additional construction projects at the Military Utility Privatization Subsidiaries, which may or may not continue at current levels in future periods.

Water

For the year ended December 31, 2016, revenues from water operations decreased by \$25.6 million to \$302.9 million, compared to \$328.5 million for the year ended December 31, 2015. The 2016 adopted revenues in the CPUC's December 2016 decision on the water general rate case were approximately \$29.8 million lower than the 2015 adopted revenues mainly due to reductions in the revenue requirement for: (i) supply costs caused by lower consumption, (ii) depreciation expense resulting from an updated depreciation study, and (iii) other operating expenses resulting from GSWC's cost containment initiatives. This reduction in water revenues was mostly offset by corresponding decreases in supply costs, depreciation and certain other operating expenses, as discussed later.

The reduction in adopted revenues discussed above was partially offset by (i) new revenues generated from a water system acquired in October 2015, (ii) higher revenues due to increased consumption as compared to 2015 from customers that are not subject to conservation rates, (iii) revenues from advice letter capital projects approved by the CPUC in 2015, and (iv) the recognition of a portion of the 2015 WRAM revenues that had previously been deferred as required under the accounting guidance for alternative revenue programs such as the WRAM. Under the accounting guidance, GSWC is required to collect its WRAM balances, net of MCBA, within 24 months following the year in which they are recorded. During the fourth quarter of 2015, GSWC did not record water revenues of \$1.4 million related to its 2015 under-collected WRAM balances as it was estimated that this amount would not be fully collected within 24 months following the end of 2015 using the required CPUC amortization guidelines. During 2016, GSWC recognized approximately \$910,000 of the \$1.4 million as water revenue.

Billed water consumption for the year ended December 31, 2016 increased slightly as compared to the same period in 2015. In general, changes in consumption do not have a significant impact on recorded revenues due to the CPUC-approved WRAM accounts in place in all three water regions. GSWC records the difference between what it bills its water customers and that which is authorized by the CPUC in the WRAM accounts as regulatory assets or liabilities.

Electric

For the year ended December 31, 2016, revenues from electric operations were \$35.8 million as compared to \$36.0 million for the year ended December 31, 2015. The decrease was due to the termination in August 2015 of a supply cost surcharge to recover previously incurred energy costs. The decrease in revenues from the termination of this surcharge was approximately \$1.4 million and had no impact on pretax operating income due to an offsetting decrease in supply costs. This decrease in revenue was mostly offset by CPUC-approved fourth-year rate increases effective January 1, 2016, and rate increases generated from advice letter filings approved by the CPUC during 2015 and 2016.

Billed electric usage for the year ended December 31, 2016 decreased by approximately 4% as compared to the same period in 2015. The cold weather and storms experienced in the Big Bear area in late 2016 resulted in less need for snowmaking. In addition, solar and energy efficiency programs offered by BVES have resulted in less customer usage. Due to the CPUC-approved base revenue requirement adjustment mechanism ("BRRAM"), which adjusts base revenues to adopted levels authorized by the CPUC, changes in usage do not have a significant impact on earnings.

Contracted Services

Revenues from contracted services are composed of construction revenues (including renewal and replacements) and management fees for operating and maintaining the water and/or wastewater systems at various military bases. For the year ended December 31, 2016, revenues from contracted services were \$97.4 million as compared to \$94.1 million for 2015. There was an increase in ongoing operations and maintenance management fees due to the successful resolution of price redeterminations, economic price adjustments and asset transfers. There was also an overall increase in construction activity at various military bases as compared to 2015. These increases were partially offset by a decrease in retroactive revenues received in 2016 as compared to 2015. In 2015, there was \$3.0 million of retroactive management fee revenues recorded related to periods prior to 2015 resulting from the resolution of several price redeterminations, as compared to approximately \$421,000 in retroactive revenues recorded in 2016 related to 2015.

ASUS subsidiaries continue to enter into U.S. government-awarded contract modifications and agreements with third-party prime contractors for new construction projects at the Military Utility Privatization Subsidiaries. During 2016, ASUS was awarded approximately \$24 million in new construction projects, the majority of which are expected to be completed during 2017. Earnings and cash flows from modifications to the original 50-year contracts with the U.S. government and agreements with third-party prime contractors for additional construction projects may or may not continue in future periods.

Operating Expenses:

Supply Costs

Supply costs for the water segment consist of purchased water, purchased power for pumping, groundwater production assessments and water-supply-cost balancing accounts. Supply costs for the electric segment consist of power purchased for resale, the cost of natural gas used by the electric segment's generating unit, the cost of renewable energy credits and the electric-supply-cost balancing account. Water and electric gross margins are each computed by subtracting total supply costs from total revenues. Registrant uses these gross margins and related percentages as important measures in evaluating its operating results. Registrant believes these measures are useful internal benchmarks in evaluating the utility business performance within its water and electric segments. Registrant reviews these measurements regularly and compares them to historical periods and to its operating budget. However, these measures, which are not presented in accordance with GAAP, may not be comparable to similarly titled measures used by other entities and should not be considered as alternatives to operating income, which is determined in accordance with GAAP.

Total supply costs comprise the largest segment of total operating expenses. Supply costs accounted for 26.8% and 30.4% of total operating expenses for the years ended December 31, 2016 and 2015, respectively.

The table below provides the amounts (in thousands) of increases (decreases) and percent changes in water and electric revenues, supply costs and gross margins during the years ended December 31, 2016 and 2015:

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
WATER OPERATING REVENUES (1)	\$ 302,931	\$ 328,511	\$ (25,580)	-7.8 %
WATER SUPPLY COSTS:				
Water purchased (1)	64,442	62,726	1,716	2.7 %
Power purchased for pumping (1)	8,663	8,988	(325)	-3.6 %
Groundwater production assessment (1)	14,993	13,648	1,345	9.9 %
Water supply cost balancing accounts (1)	(14,813)	3,623	(18,436)	-508.9 %
TOTAL WATER SUPPLY COSTS	\$ 73,285	\$ 88,985	\$ (15,700)	-17.6 %
WATER GROSS MARGIN (2)	\$ 229,646	\$ 239,526	\$ (9,880)	-4.1 %
ELECTRIC OPERATING REVENUES (1)	\$ 35,771	\$ 36,039	\$ (268)	-0.7 %
ELECTRIC SUPPLY COSTS:				
Power purchased for resale (1)	10,387	10,395	(8)	-0.1 %
Electric supply cost balancing accounts (1)	2,607	4,162	(1,555)	-37.4 %
TOTAL ELECTRIC SUPPLY COSTS	\$ 12,994	\$ 14,557	\$ (1,563)	-10.7 %
ELECTRIC GROSS MARGIN (2)	\$ 22,777	\$ 21,482	\$ 1,295	6.0 %

(1) As reported on AWR's Consolidated Statements of Income, except for supply-cost-balancing accounts. The sums of water and electric supply-cost balancing accounts in the table above are shown on AWR's Consolidated Statements of Income and totaled \$(12.2) million and \$7.8 million for the years ended December 31, 2016 and 2015, respectively. Revenues include surcharges, which increase both revenues and operating expenses by corresponding amounts, thus having no net earnings impact.

(2) Water and electric gross margins do not include depreciation and amortization, maintenance, administrative and general, property and other taxes, and other operation expenses.

Two of the principal factors affecting water supply costs are the amount of water produced and the source of the water. Generally, the variable cost of producing water from wells is less than the cost of water purchased from wholesale suppliers. Under the MCBA, GSWC tracks adopted and actual expense levels for purchased water, power purchased for pumping and

pump taxes, as established by the CPUC. GSWC records the variances (which include the effects of changes in both rate and volume) between adopted and actual purchased water, purchased power and pump tax expenses. GSWC recovers from, or refunds to, customers the amount of such variances. GSWC tracks these variances for each water rate-making area.

The overall actual percentages for purchased water for the years ended December 31, 2016 and 2015 were 40% and 41%, respectively, as compared to the adopted percentages of 29% and 36%, respectively. The increase in the percentage of purchased water was due to several wells being temporarily out of service during 2016, resulting in an increase in purchased water as compared to pumped water.

Purchased water costs for the year ended December 31, 2016 increased to \$64.4 million as compared to \$62.7 million for the same period in 2015 primarily due to an increase of purchased water in the supply mix as a result of several wells being out of service, as well as an increase in wholesale water costs as compared to the year ended December 31, 2015.

For the year ended December 31, 2016, the cost of power purchased for pumping decreased to \$8.7 million as compared to \$9.0 million for the same period in 2015 primarily due to decreases in pumped water resulting from the increase in purchased water. Groundwater production assessments were \$15.0 million in 2016 as compared to \$13.6 million in 2015 due to higher assessment rates.

The water-supply-cost balancing account decreased \$18.4 million during the year ended December 31, 2016 as compared to the same period in 2015 due to higher incurred supply costs as compared to the authorized supply costs. The authorized supply costs reflect the lower adopted customer usage.

For the years ended December 31, 2016 and 2015, the cost of power purchased for resale to BVES's customers was \$10.4 million. A decrease of 4% in customer usage for the year ended December 31, 2016 as compared to 2015 was offset by an increase in the average price per megawatt-hour ("MWh"). The average price per MWh, including fixed costs, increased from \$68.21 per MWh for the year ended December 31, 2015 to \$69.54 per MWh for the same period in 2016. The electric-supply-cost balancing account included in total supply costs decreased by \$1.6 million primarily due to the 2015 termination of supply cost surcharges, which have no impact on pretax operating income.

Other Operation

The primary components of other operation expenses for GSWC include payroll, materials and supplies, chemicals and water treatment costs and outside service costs of operating the regulated water and electric systems, including the costs associated with transmission and distribution, pumping, water quality, meter reading, billing and operations of district offices. Registrant's contracted services operations incur many of the same types of expenses. For the years ended December 31, 2016 and 2015, other operation expenses by business segment consisted of the following amounts (in thousands):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
Water Services	\$ 21,649	\$ 21,961	\$ (312)	-1.4 %
Electric Services	3,122	2,931	191	6.5 %
Contracted Services	3,486	3,537	(51)	-1.4 %
Total other operation	\$ 28,257	\$ 28,429	\$ (172)	-0.6 %

Other operation expenses at the water segment decreased by \$312,000 during the year ended December 31, 2016 as compared to the same period in 2015 due primarily to lower conservation and drought-related costs incurred during 2016, partially offset by increases in water treatment costs. Higher conservation and drought-related costs were incurred in 2015 in response to the governor of California's 2015 executive order mandating reductions in water usage. GSWC has been authorized by the CPUC to track incremental drought-related costs in a memorandum account for possible future recovery. During the second quarter of 2016, GSWC filed for recovery of drought-related items of approximately \$1.3 million including \$1.0 million in costs, which had been previously incurred mostly in 2015. Incremental drought-related costs were being expensed until recovery is approved by the CPUC. In February 2017, the CPUC approved recovery of the amounts included in this drought-related memorandum account. Accordingly, GSWC will reflect the approval during the first quarter of 2017 mostly as a reduction to operation-related expenses.

The increase in other operation expenses at the electric segment was due to outside services costs and labor costs incurred in response to power outages caused by severe winter storms experienced in January 2016.

Administrative and General

Administrative and general expenses include payroll related to administrative and general functions, the related employee benefits, insurance expenses, outside legal and consulting fees, regulatory utility commission expenses, expenses associated with being a public company and general corporate expenses charged to expense accounts. For the years ended December 31, 2016 and 2015, administrative and general expenses by business segment, including AWR (parent), consisted of the following amounts (in thousands):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
Water Services	\$ 56,165	\$ 55,977	\$ 188	0.3 %
Electric Services	7,901	8,900	(999)	-11.2 %
Contracted Services	16,909	14,929	1,980	13.3 %
AWR (parent)	19	11	8	72.7 %
Total administrative and general	\$ 80,994	\$ 79,817	\$ 1,177	1.5 %

For the year ended December 31, 2016, administrative and general expenses at the water segment increased overall due, in large part, to an increase of approximately \$4.0 million in legal and other outside service costs incurred on condemnation-related matters. Legal and other outside service costs for these matters are expected to continue; however, the level of costs are expected to fluctuate from year to year. The increase in these outside services was mostly offset by decreases in pension costs, transportation-related expenses, and a higher allocation of corporate headquarters costs to the contracted services segment. The decreases in these expenses were also reflected in the newly adopted water revenue requirement.

For the year ended December 31, 2016, administrative and general expenses for the electric segment decreased by \$1.0 million as compared to the same period in 2015 due primarily to decreases in costs associated with the energy-efficiency and solar-initiative programs approved by the CPUC. The costs of these programs have been included in customer rates equally over the rate cycle. The spending of such funds had increased in 2015 due to the delay in receiving the final decision in November 2014 of the BVES rate case, which authorized these programs. There was also a lower allocation of administrative and general expenses to the electric segment from the corporate headquarters in 2016, as stipulated in the decision of the water general rate case.

For the year ended December 31, 2016, administrative and general expenses for contracted services increased by \$2.0 million due to (i) an increase of \$1.3 million in the allocation of administrative and general expenses from GSWC to the contracted services segment as stipulated in the final decision on the water general rate case, and (ii) increases in ASUS labor-related costs.

Depreciation and Amortization

For the years ended December 31, 2016 and 2015, depreciation and amortization expense by segment consisted of the following amounts (in thousands):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
Water Services	\$ 35,777	\$ 39,190	\$ (3,413)	-8.7 %
Electric Services	2,027	1,703	324	19.0 %
Contracted Services	1,046	1,140	(94)	-8.2 %
Total depreciation and amortization	\$ 38,850	\$ 42,033	\$ (3,183)	-7.6 %

For the year ended December 31, 2016, depreciation and amortization expense for the water segment decreased by \$3.4 million due to lower composite depreciation rates used in 2016 resulting from an updated depreciation study in the water general rate case. This decrease was partially offset by depreciation on additions to utility plant during 2016. The lower net depreciation expense has been reflected in the newly adopted water revenue requirement.

For the year ended December 31, 2016, depreciation and amortization expense for the electric segment increased due primarily from the impact of capital additions.

Maintenance

For the years ended December 31, 2016 and 2015, maintenance expense by segment consisted of the following amounts (in thousands):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
Water Services	\$ 13,783	\$ 13,935	\$ (152)	-1.1 %
Electric Services	736	758	(22)	-2.9 %
Contracted Services	1,951	2,192	(241)	-11.0 %
Total maintenance	\$ 16,470	\$ 16,885	\$ (415)	-2.5 %

Maintenance expense for contracted services decreased due primarily to (i) a decrease in labor costs associated with maintenance-related activities, and (ii) a decrease in outside services costs.

Property and Other Taxes

For the years ended December 31, 2016 and 2015, property and other taxes by segment, consisted of the following amounts (in thousands):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
Water Services	\$ 14,362	\$ 14,250	\$ 112	0.8 %
Electric Services	1,082	994	88	8.9 %
Contracted Services	1,357	1,392	(35)	-2.5 %
Total property and other taxes	\$ 16,801	\$ 16,636	\$ 165	1.0 %

ASUS Construction

For the year ended December 31, 2016, construction expenses for contracted services were \$53.7 million, increasing by \$910,000 compared to the same period in 2015 due to increased construction activity as compared to 2015.

Interest Expense

For the years ended December 31, 2016 and 2015, interest expense by segment, including AWR (parent), consisted of the following amounts (in thousands):

	Year Ended 12/31/2016	Year Ended 12/31/2015	\$ CHANGE	% CHANGE
Water Services	\$ 20,430	\$ 19,898	\$ 532	2.7%
Electric Services	1,352	1,100	252	22.9%
Contracted Services	76	33	43	130.3%
AWR (parent)	134	57	77	135.1%
Total interest expense	\$ 21,992	\$ 21,088	\$ 904	4.3%

Overall, interest expense for the year ended December 31, 2016 increased by \$904,000 as compared to the same period in 2015 due, in part, to capitalized interest during the first quarter of 2015 at the water segment resulting from the recording of an allowance for funds used during construction in connection with the CPUC's approval of a filing for advice letter capital projects. There was no similar item during 2016. There was also an increase in interest expense due to higher borrowings on the revolving credit facility during 2016. Borrowings on the revolving credit facility are expected to continue in 2017 to fund operations and a portion of capital expenditures.

Interest Income

For the years ended December 31, 2016 and 2015, interest income by business segment, including AWR (parent), consisted of the following amounts (in thousands):

	Year Ended	Year Ended	\$	%
	12/31/2016	12/31/2015	CHANGE	CHANGE
Water Services	\$ 734	\$ 430	\$ 304	70.7 %
Electric Services	15	10	5	50.0 %
Contracted Services	8	7	1	14.3 %
AWR (parent)	—	11	(11)	-100.0 %
Total interest income	\$ 757	\$ 458	\$ 299	65.3 %

Interest income increased by \$299,000 for the year ended December 31, 2016 as compared to the same period in 2015 due primarily to higher interest accrued on regulatory assets as compared to the same period in 2015.

Other, net

For the year ended December 31, 2016, other income increased by \$641,000 primarily due to higher gains recorded on investments held for a retirement benefit plan resulting from recent market conditions as compared to 2015.

Income Tax Expense

For the years ended December 31, 2016 and 2015, income tax expense by segment, including AWR (parent), consisted of the following amounts (in thousands):

	Year Ended	Year Ended	\$	%
	12/31/2016	12/31/2015	CHANGE	CHANGE
Water Services	\$ 25,894	\$ 30,302	\$ (4,408)	-14.5 %
Electric Services	2,715	2,170	545	25.1 %
Contracted Services	6,672	6,069	603	9.9 %
AWR (parent)	(546)	(810)	264	-32.6 %
Total income tax expense	\$ 34,735	\$ 37,731	\$ (2,996)	-7.9 %

Consolidated income tax expense for the year ended December 31, 2016 decreased by \$3.0 million due primarily to a decrease in pretax income as well as a decrease in the overall effective income tax rate ("ETR"). AWR's ETR was 36.8% for the year ended December 31, 2016 as compared to 38.4% for the same period in 2015. The ETR for GSWC was 37.9% for 2016 as compared to 40.6% for 2015 due primarily to differences between book and taxable income that are treated as flow-through adjustments in accordance with regulatory requirements, and permanent differences such as deductions related to production activities. The decrease in GSWC's ETR was partially offset by an increase in the ETR at the contracted services segment, which was due mostly to higher state taxes, which vary among the jurisdictions in which it operates.

Consolidated Results of Operations — Years Ended December 31, 2015 and 2014 (dollar amounts in thousands, except per share amounts):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
OPERATING REVENUES				
Water	\$ 328,511	\$ 326,672	\$ 1,839	0.6 %
Electric	36,039	34,387	1,652	4.8 %
Contracted services	94,091	104,732	(10,641)	-10.2 %
Total operating revenues	<u>458,641</u>	<u>465,791</u>	<u>(7,150)</u>	<u>-1.5 %</u>
OPERATING EXPENSES				
Water purchased	62,726	57,790	4,936	8.5 %
Power purchased for pumping	8,988	10,700	(1,712)	-16.0 %
Groundwater production assessment	13,648	16,450	(2,802)	-17.0 %
Power purchased for resale	10,395	9,649	746	7.7 %
Supply cost balancing accounts	7,785	6,346	1,439	22.7 %
Other operation	28,429	28,288	141	0.5 %
Administrative and general	79,817	78,268	1,549	2.0 %
Depreciation and amortization	42,033	41,073	960	2.3 %
Maintenance	16,885	16,092	793	4.9 %
Property and other taxes	16,636	16,722	(86)	-0.5 %
ASUS construction	52,810	65,368	(12,558)	-19.2 %
Total operating expenses	<u>340,152</u>	<u>346,746</u>	<u>(6,594)</u>	<u>-1.9 %</u>
OPERATING INCOME	118,489	119,045	(556)	-0.5 %
OTHER INCOME AND EXPENSES				
Interest expense	(21,088)	(21,617)	529	-2.4 %
Interest income	458	927	(469)	-50.6 %
Other, net	356	751	(395)	-52.6 %
	<u>(20,274)</u>	<u>(19,939)</u>	<u>(335)</u>	<u>1.7 %</u>
INCOME FROM OPERATIONS BEFORE INCOME TAX EXPENSE	98,215	99,106	(891)	-0.9 %
Income tax expense	37,731	38,048	(317)	-0.8 %
INCOME FROM OPERATIONS	<u>\$ 60,484</u>	<u>\$ 61,058</u>	<u>\$ (574)</u>	<u>-0.9 %</u>
Basic earnings per Common Share	<u>\$ 1.61</u>	<u>\$ 1.57</u>	<u>\$ 0.04</u>	<u>2.5 %</u>
Diluted earnings per Common Share	<u>\$ 1.60</u>	<u>\$ 1.57</u>	<u>\$ 0.03</u>	<u>1.9 %</u>

The table below sets forth diluted earnings per share by business segment for AWR's operations:

	Diluted Earnings per Share		
	Year Ended		CHANGE
	12/31/2015	12/31/2014	
Water	\$ 1.19	\$ 1.16	\$ 0.03
Electric	0.07	0.07	—
Contracted services	0.32	0.31	0.01
AWR (parent)	0.02	0.03	(0.01)
Totals from operations, as reported	\$ 1.60	\$ 1.57	\$ 0.03

Water Segment:

For the year ended December 31, 2015, fully diluted earnings per share for the water segment increased by \$0.03 per share to \$1.19 per share, as compared to \$1.16 per share for 2014. The discussion below includes the items which impacted the comparability between the two periods. The discussion excludes the effects of a decrease in water surcharges billed to customers to recover previously incurred costs, which resulted in lower water revenues of approximately \$2.0 million with a corresponding decrease in operating expenses and, therefore, had no impact on operating income.

- The water gross margin increased by \$1.2 million primarily as a result of CPUC-approved third-year rate increases and advice letter filings for the completion of certain capital projects not previously included in rates. These increases were partially offset by \$1.4 million of under-collections in the 2015 WRAM not recorded as revenue, as this amount is estimated to not be fully collectable within 24 months following the end of the year under current CPUC amortization guidelines. Under the accounting guidance for alternative revenue programs such as the WRAM, GSWC is required to collect its WRAM balances, net of MCBA, within 24 months following the year in which they are recorded. Due to the state-mandated water-conservation targets, lower water usage has resulted in an increase in under-collections recorded in the 2015 WRAM accounts. Based on the CPUC guidelines, some of GSWC's ratemaking areas will have recovery periods greater than 24 months. This accounting guidance impacts the timing of when WRAM revenues are recorded, but not the collectability; therefore, the \$1.4 million will be recognized as revenue in future periods as it becomes collectable within 24 months.
- Excluding supply costs, there was an increase in operating expenses of approximately \$1.0 million due primarily to increases in maintenance costs and depreciation expense. These increases in operating expenses were partially offset by lower other operation-related costs, such as water treatment, mainly as a result of decreases in water usage and pumped water.
- An increase in earnings per share for the water segment due to the Company's stock repurchase programs in 2014 and 2015 was partially offset by a decrease in other income, net of other expenses (including interest), of \$637,000 due to a decrease in interest income as well as a decrease in gains on investments held for a retirement benefit plan during 2015.

Electric Segment:

For the years ended December 31, 2015 and 2014, diluted earnings from the electric segment were \$0.07 per share. Third-year rate increases approved by the CPUC were mostly offset by an increase in operating expenses mainly attributable to costs associated with energy-efficiency and solar-initiative programs approved by the CPUC. The costs of these programs have been included in customer rates equally over the rate cycle. The spending of such funds increased in 2015 due to the delay in receiving the final decision in November 2014 of the BVES rate case, which authorized these programs.

Contracted Services Segment:

For the year ended December 31, 2015, diluted earnings from contracted services were \$0.32 per share, compared to \$0.31 per share for the same period in 2014. Impacting the comparability between the two periods were the following items:

- An increase of \$2.6 million in operations and maintenance ("O&M") management fees in 2015 as a result of successful resolutions of various price redeterminations received during the third quarter of 2015. These price redeterminations included an increase of \$1.2 million in retroactive O&M management fees, as compared to the retroactive impact for the price redeterminations received in the same period of 2014.

- An increase in operating expenses of \$2.0 million primarily due to an increase in labor, insurance and other outside services costs.
- An overall decrease in construction activity reducing pretax operating income by approximately \$2.0 million due to significant work on several larger projects being substantially completed during 2014, which did not recur in 2015.
- An increase in earnings per share due to the Company's stock repurchase programs, as well as a reduction in state income taxes, which vary among the jurisdictions in which it operates.

AWR (parent):

Diluted earnings from AWR (parent) decreased \$0.01 per share as compared to the same period in 2014 due primarily to higher state income taxes.

The following discussion and analysis for the years ended December 31, 2015 and 2014 provides information on AWR's consolidated operations and assets and, where necessary, includes specific references to AWR's individual segments and subsidiaries: GSWC and ASUS and its subsidiaries.

Operating Revenues

Water

For the year ended December 31, 2015, revenues from water operations increased by \$1.8 million to \$328.5 million, compared to \$326.7 million for the year ended December 31, 2014. The increase in water revenues was primarily due to CPUC-approved third-year rate increases effective January 1, 2015 for certain rate-making areas and CPUC-approved increases generated from advice letter filings. There were also CPUC-approved increases in rates implemented during the second and third quarters of 2014 specifically intended to cover increases in supply costs experienced in certain rate-making areas, increasing revenues by \$2.9 million for the year ended December 31, 2015 as compared to the same period in 2014. This increase in revenues was offset by a corresponding increase in supply cost, resulting in no impact to pretax operating income.

These increases were partially offset by a \$2.0 million decrease in surcharges during the year ended December 31, 2015 to recover previously incurred costs approved by the CPUC. Most of these surcharges were implemented in 2013 and expired during 2014. The decrease in revenues from these surcharges was offset by a corresponding decrease in operating expenses (primarily administrative and general) resulting in no impact to pretax operating income.

Billed water consumption for the year ended December 31, 2015 decreased by approximately 16% as compared to the same period in 2014. In general, changes in consumption do not have a significant impact on recorded revenues due to the CPUC-approved WRAM accounts in place in all three water regions. However, under the accounting guidance for alternative revenue programs such as the WRAM, significant decreases in consumption may impact the timing of when revenues are recorded. During the fourth quarter of 2015, GSWC did not record \$1.4 million of the 2015 WRAM under-collection balance as revenue, as previously discussed. GSWC records the difference between what it bills its water customers and that which is authorized by the CPUC in the WRAM accounts as regulatory assets or liabilities.

Electric

For the year ended December 31, 2015, revenues from electric operations increased by \$1.6 million to \$36.0 million as compared to \$34.4 million for the year ended December 31, 2014. In November 2014, the CPUC issued a final decision on BVES's general rate case, which set new rates for years 2013—2016. The new rates were retroactive to January 1, 2013. The newly adopted revenues for the years 2013 through 2016 are lower than revenues in the previous rate cycle resulting from a revised return on equity of 9.95%, as well as lower depreciation and certain other operating expenses. As a result of the final decision, a cumulative reduction in revenues was recorded during the fourth quarter of 2014, along with a cumulative reduction in depreciation expense. The impact of the retroactive effect of the new rates to BVES's 2014 net earnings was not significant. However, because the new rates were retroactive to January 1, 2013, a portion of the retroactive adjustment recorded during the fourth quarter of 2014 related to 2013. Excluding the impact of 2013's retroactive adjustment, electric revenues increased by approximately \$500,000 in 2015 as compared to 2014 due primarily to the CPUC-approved third-year rate increases effective January 1, 2015 and the CPUC-approved increases generated from advice letter filings.

Billed electric usage for the year ended December 31, 2015 increased 5.4% as compared to the same period in 2014. The winters experienced in California during the first and fourth quarters of 2014 were too warm for snowmaking, resulting in less electric usage in the Big Bear area than in 2015. Due to the CPUC-approved base revenue requirement adjustment mechanism, which adjusts base revenues to adopted levels authorized by the CPUC, changes in usage do not have a significant impact on earnings.

Contracted Services

Revenues from contracted services are composed of construction revenues (including renewal and replacements) and management fees for operating and maintaining the water and/or wastewater systems at various military bases. For the year ended December 31, 2015, revenues from contracted services were \$94.1 million as compared to \$104.7 million for 2014. The decrease was due primarily to the completion of several large capital upgrade projects during 2014 which did not recur in 2015. The decrease in construction revenues was partially offset by an increase in operations and maintenance management fees as a result of successful resolutions of various price redeterminations during the third quarter of 2015, increasing earnings by approximately \$3.0 million as compared to 2014. These price redeterminations also included an increase of \$1.2 million in retroactive operations and maintenance management fees, as compared to the retroactive impact for the price redeterminations received in 2014.

ASUS's subsidiaries continue to enter into U.S. government-awarded contract modifications and agreements with third-party prime contractors for new construction projects at the Military Utility Privatization Subsidiaries. During the third quarter of 2015, the U.S. government awarded ASUS approximately \$50.0 million in new construction projects, much of which was completed during 2016 with the balance carrying into 2017. Similarly, during the third quarter of 2014, the U.S. government awarded ASUS \$27.0 million in new construction projects, the majority of which were completed in 2015. Earnings and cash flows from modifications to the original 50-year contracts with the U.S. government and agreements with third-party prime contractors for additional construction projects may or may not continue in future periods.

Operating Expenses:

Supply Costs

Supply costs accounted for 30.4% and 29.1% of total operating expenses for the years ended December 31, 2015 and 2014, respectively.

The table below provides the amounts (in thousands) of increases (decreases) and percent changes in water and electric revenues, supply costs and gross margins during the years ended December 31, 2015 and 2014:

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
WATER OPERATING REVENUES (1)	\$ 328,511	\$ 326,672	\$ 1,839	0.6 %
WATER SUPPLY COSTS:				
Water purchased (1)	62,726	57,790	4,936	8.5 %
Power purchased for pumping (1)	8,988	10,700	(1,712)	-16.0 %
Groundwater production assessment (1)	13,648	16,450	(2,802)	-17.0 %
Water supply cost balancing accounts (1)	3,623	1,378	2,245	162.9 %
TOTAL WATER SUPPLY COSTS	\$ 88,985	\$ 86,318	\$ 2,667	3.1 %
WATER GROSS MARGIN (2)	\$ 239,526	\$ 240,354	\$ (828)	-0.3 %
ELECTRIC OPERATING REVENUES (1)	\$ 36,039	\$ 34,387	\$ 1,652	4.8 %
ELECTRIC SUPPLY COSTS:				
Power purchased for resale (1)	10,395	9,649	746	7.7 %
Electric supply cost balancing accounts (1)	4,162	4,968	(806)	-16.2 %
TOTAL ELECTRIC SUPPLY COSTS	\$ 14,557	\$ 14,617	\$ (60)	-0.4 %
ELECTRIC GROSS MARGIN (2)	\$ 21,482	\$ 19,770	\$ 1,712	8.7 %

- (1) As reported on AWR's Consolidated Statements of Income, except for supply-cost balancing accounts. The sums of water and electric supply-cost balancing accounts in the table above is shown on AWR's Consolidated Statements of Income and totaled \$7.8 million and \$6.3 million for the years ended December 31, 2015 and 2014, respectively. Revenues include surcharges, which increase both revenues and operating expenses by corresponding amounts, thus having no net earnings impact.
- (2) Water and electric adjusted gross margins do not include depreciation and amortization, maintenance, administrative and general, property and other taxes, and other operation expenses.

The overall actual percentages for purchased water for the years ended December 31, 2015 and 2014 were 41% and 35%, respectively, as compared to the adopted percentages of 36% and 35%, respectively. The increase in the supply mix was due to several wells being temporarily out of service during 2015, resulting in an increase in purchased water as compared to pumped water.

Purchased water costs for the year ended December 31, 2015 increased by 8.5% to \$62.7 million as compared to \$57.8 million for the same period in 2014 primarily due to an increase of purchased water in the supply mix as a result of wells being out of service, and an increase in wholesale water costs as compared to the year ended December 31, 2014. These increases were partially offset by a lower volume of water purchased due to lower water consumption.

For the year ended December 31, 2015, the cost of power purchased for pumping decreased to \$9.0 million as compared to \$10.7 million for the same period in 2014 primarily due to decreases in pumped water resulting from lower water consumption and an increase in purchased water. Groundwater production assessments were \$13.6 million in 2015 as compared to \$16.5 million in 2014 due to a decrease in well production resulting from several wells being out of service during 2015 as compared to 2014.

The water-supply-cost balancing account increased \$2.2 million during the year ended December 31, 2015 as compared to the same period in 2014 due to rates implemented in mid-2014 specifically intended to cover increases in supply costs for certain rate-making areas. This increase in revenues was offset by a corresponding increase in the water-supply-cost balancing account, resulting in no impact to the water gross dollar margin. There was also an increase due to lower customer water usage during 2015 as compared to 2014. These increases in the water-supply-cost balancing account were partially offset by increases in water vendor rates and an increase in purchased water in the water supply mix as compared to 2014.

For the year ended December 31, 2015, the cost of power purchased for resale to BVES's customers increased to \$10.4 million, as compared to \$9.6 million for the year ended December 31, 2014, due to an increase in customer usage during the year ended December 31, 2015, partially offset by a decrease in the average price per MWh. Customer usage increased 5.4% as compared to the year ended December 31, 2014. The average price per MWh, including fixed costs, decreased from \$65.78 per MWh for the year ended December 31, 2014 to \$68.21 per MWh for the same period in 2015. The electric-supply-cost balancing account included in total supply costs decreased by \$806,000 primarily due to a decrease in supply cost surcharges, which have no impact on pretax operating income.

Other Operation

For the years ended December 31, 2015 and 2014, other operation expenses by segment consisted of the following (dollar amounts in thousands):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
Water Services	\$ 21,961	\$ 22,871	\$ (910)	-4.0 %
Electric Services	2,931	2,677	254	9.5 %
Contracted Services	3,537	2,740	797	29.1 %
Total other operation	\$ 28,429	\$ 28,288	\$ 141	0.5 %

Excluding an overall reduction of \$286,000 in billed surcharges, which have no impact on earnings, other operation expenses at the utility segments decreased by \$370,000 during the year ended December 31, 2015 as compared to the same period in 2014. The decrease was due primarily to lower water treatment costs as a result of lower water consumption as well as a higher amount of filter replacements performed in 2014, and a reduction in materials and supplies and bad debt expenses at the water segment. These decreases were partially offset by an increase in drought-related costs at the water segment and labor-related expenses at the electric segment. In April 2015, as a response to ongoing drought conditions, the Governor of California issued an executive order mandating an overall 25% reduction in water usage as compared to 2013. GSWC has been authorized by the CPUC to track incremental drought-related costs incurred in a memorandum account for possible future recovery. In February 2017, the memorandum account was approved for recovery by the CPUC.

For the year ended December 31, 2015, other operation expenses for the contracted services segment increased by \$797,000 as compared to the same period in 2014 primarily due to a shift in labor costs to operation-related activities from administrative and general activities.

Administrative and General

For the years ended December 31, 2015 and 2014, administrative and general expenses by segment, including AWR (parent), consisted of the following (dollar amounts in thousands):

	Year Ended	Year Ended	\$	%
	12/31/2015	12/31/2014	CHANGE	CHANGE
Water Services	\$ 55,977	\$ 57,729	\$ (1,752)	-3.0 %
Electric Services	8,900	8,085	815	10.1 %
Contracted Services	14,929	12,406	2,523	20.3 %
AWR (parent)	11	48	(37)	-77.1 %
Total administrative and general	\$ 79,817	\$ 78,268	\$ 1,549	2.0 %

Excluding an overall reduction of \$1.7 million in billed surcharges, which have no impact on earnings, administrative and general expenses for the water services segment decreased slightly during the year ended December 31, 2015 as compared to the same period in 2014. Lower employee-related costs were mostly offset by increases in legal and other outside services costs primarily related to condemnation activities. Legal and outside services costs tend to fluctuate and are expected to continue to fluctuate.

Excluding an overall reduction of \$96,000 in billed surcharges, which have no impact on earnings, administrative and general expenses for the electric services segment increased by \$911,000 during the year ended December 31, 2015 as compared to the same period in 2014 due primarily to an increase in costs associated with energy-efficiency and solar-initiative programs approved by the CPUC. The costs of these programs have been included in customer rates equally over the rate cycle. The spending of such funds increased in 2015 due to the delay in receiving the final decision in November 2014 of the BVES rate case, which authorized these programs.

For the year ended December 31, 2015, administrative and general expenses for contracted services increased by \$2.5 million primarily due to a shift in labor and other indirect costs to administrative and general-related activities, in support of various functions at ASUS, from construction-related activities. There was also an increase in insurance and other outside services costs, as compared to the same period in 2014.

Depreciation and Amortization

For the years ended December 31, 2015 and 2014, depreciation and amortization by segment consisted of the following (dollar amounts in thousands):

	Year Ended	Year Ended	\$	%
	12/31/2015	12/31/2014	CHANGE	CHANGE
Water Services	\$ 39,190	\$ 38,388	\$ 802	2.1 %
Electric Services	1,703	1,466	237	16.2 %
Contracted Services	1,140	1,219	(79)	-6.5 %
Total depreciation and amortization	\$ 42,033	\$ 41,073	\$ 960	2.3 %

For the year ended December 31, 2015, depreciation and amortization expense for the utility segments increased by \$1.0 million resulting primarily from additions to utility plant during 2014.

Maintenance

For the years ended December 31, 2015 and 2014, maintenance expense by segment consisted of the following (dollar amounts in thousands):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
Water Services	\$ 13,935	\$ 13,067	\$ 868	6.6 %
Electric Services	758	878	(120)	-13.7 %
Contracted Services	2,192	2,147	45	2.1 %
Total maintenance	\$ 16,885	\$ 16,092	\$ 793	4.9 %

For the year ended December 31, 2015, maintenance expense for water services increased by \$868,000 compared to the year ended December 31, 2014 due to higher levels of both planned and unplanned maintenance performed in 2015.

For the year ended December 31, 2015, maintenance expense for electric services decreased by \$120,000 due to a higher level of expenses related to unplanned maintenance and tree trimming performed in 2014.

Property and Other Taxes

For the years ended December 31, 2015 and 2014, property and other taxes by segment, consisted of the following (dollar amounts in thousands):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
Water Services	\$ 14,250	\$ 14,285	\$ (35)	-0.2 %
Electric Services	994	936	58	6.2 %
Contracted Services	1,392	1,501	(109)	-7.3 %
Total property and other taxes	\$ 16,636	\$ 16,722	\$ (86)	-0.5 %

For the year ended December 31, 2015, property and other taxes for contracted services decreased by \$109,000 due to lower gross receipts taxes primarily resulting from the elimination of such taxes in North Carolina effective July 1, 2014.

ASUS Construction

For the year ended December 31, 2015, construction expenses for contracted services were \$52.8 million, decreasing by \$12.6 million compared to the same period in 2014 due primarily to significant work on several larger projects being substantially completed during 2014, which did not recur in 2015. In addition, there was a higher amount of internal labor incurred for administrative and general-related activities, while in 2014 such labor was incurred for construction activities.

Interest Expense

For the years ended December 31, 2015 and 2014, interest expense by segment, including AWR (parent), consisted of the following (dollar amounts in thousands):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
Water Services	\$ 19,898	\$ 20,260	\$ (362)	-1.8 %
Electric Services	1,100	1,264	(164)	-13.0 %
Contracted Services	33	151	(118)	-78.1 %
AWR (parent)	57	(58)	115	-198.3 %
Total interest expense	\$ 21,088	\$ 21,617	\$ (529)	-2.4 %

Overall, interest expense for the year ended December 31, 2015 decreased by \$529,000 as compared to the same period in 2014 due largely to an increase in capitalized interest at the water segment resulting from the approval of an allowance for funds used during construction from advice letter filings approved by the CPUC during the first quarter of 2015. In addition, GSWC replaced \$15.0 million of certain long-term notes during the fourth quarter of 2014 with a note that bears a lower interest rate.

Interest Income

For the years ended December 31, 2015 and 2014, interest income by segment, including AWR (parent) consisted of the following (dollar amounts in thousands):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
Water Services	\$ 430	\$ 890	\$ (460)	-51.7 %
Electric Services	10	4	6	150.0 %
Contracted Services	7	9	(2)	-22.2 %
AWR (parent)	11	24	(13)	-54.2 %
Total interest income	\$ 458	\$ 927	\$ (469)	-50.6 %

Interest income decreased by \$469,000 for the year ended December 31, 2015 as compared to the same period in 2014 due to interest collected on certain outstanding balances owed to GSWC during 2014. There was no similar item in 2015.

Other, net

For the year ended December 31, 2015, other income decreased by \$395,000 primarily due to lower gains recorded on investments held for a retirement benefit plan resulting from recent market conditions as compared to 2014.

Income Tax Expense

For the years ended December 31, 2015 and 2014, income tax expense by segment, including AWR (parent), consisted of the following (dollar amounts in thousands):

	Year Ended 12/31/2015	Year Ended 12/31/2014	\$ CHANGE	% CHANGE
Water Services	\$ 30,302	\$ 30,410	\$ (108)	-0.4 %
Electric Services	2,170	1,596	574	36.0 %
Contracted Services	6,069	7,038	(969)	-13.8 %
AWR (parent)	(810)	(996)	186	-18.7 %
Total income tax expense	\$ 37,731	\$ 38,048	\$ (317)	-0.8 %

Consolidated income tax expense for the year ended December 31, 2015 decreased by \$317,000 due primarily to a decrease in pretax income. AWR's consolidated effective income tax rate ("ETR") was 38.4% for the years ended December 31, 2015 and 2014. The ETR for GSWC was 40.6% for 2015 as compared to 40.1% for 2014 due primarily to differences between book and taxable income that are treated as flow-through adjustments in accordance with regulatory requirements, and permanent differences such as deductions related to production activities. The increase in ETR for GSWC was partially offset by a lower ETR at the contracted services segment due mostly to lower state taxes, which vary among the jurisdictions in which it operates.

Critical Accounting Policies and Estimates

Critical accounting policies and estimates are those that are important to the portrayal of AWR's financial condition, results of operations and cash flows, and require the most difficult, subjective or complex judgments of AWR's management. The need to make estimates about the effect of items that are uncertain is what makes these judgments difficult, subjective and/or complex. Management makes subjective judgments about the accounting and regulatory treatment of many items. The following are accounting policies that are critical to the financial statements of AWR. For more information regarding the significant accounting policies of Registrant, see Note 1 of "Notes to Financial Statements" included in Part II, Item 8, in Financial Statements and Supplementary Data.

Accounting for Rate Regulation — Because Registrant operates extensively in a regulated business, it is subject to the authoritative guidance for accounting for the effects of certain types of regulation. Application of this guidance requires accounting for certain transactions in accordance with regulations adopted by the regulatory commissions of the states in which rate-regulated operations are conducted. Utility companies defer costs and credits on the balance sheet as regulatory assets and liabilities when it is probable that those costs and credits will be recognized in the ratemaking process in a period different from the period in which they would have been reflected in income by an unregulated company. These deferred regulatory assets and liabilities are then reflected in the income statement in the period in which the same amounts are reflected in the rates charged for service.

Regulation and the effects of regulatory accounting have the most significant impact on the financial statements of Registrant. When GSWC files for adjustments to rates, the capital assets, operating costs and other matters are subject to review, and disallowances may occur. In the event that a portion of the Registrant's operations is no longer subject to the accounting guidance for the effects of certain types of regulation, Registrant is required to write off related regulatory assets that are not specifically recoverable and determine if other assets might be impaired. If the CPUC determines that a portion of the Registrant's assets are not recoverable in customer rates, Registrant is required to determine if it has suffered an asset impairment that would require a write-down in the asset valuation. At December 31, 2016, the consolidated balance sheet included net regulatory assets of approximately \$146.3 million. Management continually evaluates the anticipated recovery of regulatory assets, liabilities, and revenues subject to refund and will provide for allowances and/or reserves as necessary. In the event that Registrant's assessment as to the probability of the inclusion in the ratemaking process is incorrect, the associated regulatory asset or liability will be adjusted to reflect the change in assessment or the impact of regulatory approval of rates. Reviews by the CPUC may also result in additional regulatory liabilities to refund previously collected revenues to customers if the CPUC disallows costs included in the ratemaking process.

Registrant also reviews its utility plant in service for possible impairment in accordance with accounting guidance for regulated entities for abandonments and disallowances of plant costs.

Revenue Recognition — GSWC records water and electric utility operating revenues when the service is provided to customers. Operating revenues include unbilled revenues that are earned (i.e., the service has been provided) but not billed by the end of each accounting period. Unbilled revenues are calculated based on the number of days and total usage from each customer's most recent billing record that was billed prior to the end of the accounting period and is used to estimate unbilled consumption as of the year-end reporting period. Unbilled revenues are recorded for both monthly and bi-monthly customers.

The CPUC granted GSWC the authority to implement revenue decoupling mechanisms through the adoption of the Water Revenue Adjustment Mechanism ("WRAM") and the Base Revenue Requirement Adjustment Mechanism ("BRRAM"). With the adoption of these alternative revenue programs, GSWC adjusts revenues in the WRAM and BRRAM for the difference between what is billed to its regulated customers and that which is authorized by the CPUC.

As required by the accounting guidance for alternative revenue programs, GSWC is required to collect its WRAM and BRRAM balances within 24 months following the year in which they are recorded. The CPUC has set the recovery period for under-collected balances that are up to 15% of adopted annual revenues at 18 months or less. For net WRAM under-collected balances greater than 15%, the recovery period is 19 to 36 months. As a result of the accounting guidance and CPUC-adopted recovery periods, Registrant must estimate if any WRAM and BRRAM revenues will be collected beyond the 24-month requirement, which can affect the timing of when such revenues are recognized.

Revenues for operations and maintenance contracts are recognized when services have been rendered to the U.S. government pursuant to 50-year contracts. Revenues from construction activities are recognized based on either the percentage-of-completion or cost-plus methods of accounting. In accordance with GAAP, revenue recognition under these methods requires management to estimate the progress toward completion on a contract in terms of efforts (such as costs incurred) or, in the case of the percentage-of-completion method, in terms of results achieved (such as units constructed).

These approaches are used because management considers it to be the best available measure of progress on these contracts. Changes in job performance, job conditions, change orders and estimated profitability, including those arising from any contract penalty provisions, and final contract settlements may result in revisions to costs and income and are recognized in the period in which the revisions are determined. Unbilled receivables from the U.S. government represent amounts to be billed for construction work completed and/or for services rendered pursuant to the 50-year contracts with the U.S. government, which are not presently billable but which will be billed under the terms of the contracts.

Income Taxes — Registrant’s income tax calculations require estimates due principally to the regulated nature of the operations of GSWC, the multiple states in which Registrant operates, and potential future tax rate changes. Registrant uses the asset and liability method of accounting for income taxes under which deferred tax assets and liabilities are recognized for future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which these temporary differences are expected to be recovered or settled. Changes in regulatory treatment, or significant changes in tax-related estimates, assumptions or law, could have a material impact on the financial position and results of operations of Registrant.

As a regulated utility, GSWC treats certain temporary differences as flow-through adjustments in computing its income tax expense consistent with the income tax approach approved by the CPUC for ratemaking purposes. Flow-through adjustments increase or decrease tax expense in one period, with an offsetting decrease or increase occurring in another period. Giving effect to these temporary differences as flow-through adjustments typically results in a greater variance between the effective tax rate and the statutory federal income tax rate in any given period than would otherwise exist if GSWC were not required to account for its income taxes as a regulated enterprise. As of December 31, 2016, Registrant’s total amount of unrecognized tax benefits was zero.

Pension Benefits — Registrant’s pension benefit obligations and related costs are calculated using actuarial concepts within the framework of accounting guidance for employers’ accounting for pensions and post-retirement benefits other than pensions. Two critical assumptions, the discount rate and the expected return on plan assets, are important elements of expense and/or liability measurement. We evaluate these critical assumptions annually. Other assumptions include employee demographic factors such as retirement patterns, mortality, turnover and rate of compensation increase. The discount rate enables Registrant to state expected future cash payments for benefits as a present value on the measurement date. The guideline for setting this rate is a high-quality, long-term corporate bond rate. Registrant’s discount rates were determined by considering the average of pension yield curves constructed using a large population of high-quality corporate bonds. The resulting discount rates reflect the matching of plan liability cash flows to the yield curves. A lower discount rate increases the present value of benefit obligations and increases periodic pension expense. Conversely, a higher discount rate decreases the present value of benefit obligations and decreases periodic pension expense. To determine the expected long-term rate of return on the plan assets, Registrant considers the current and expected asset allocation, as well as historical and expected returns on each plan asset class. A lower expected rate of return on plan assets will increase pension expense. The long-term expected return on plan assets was 7.00% in 2016 and 2015 for the pension plan.

For the pension plan obligation, Registrant decreased the discount rate to 4.44% as of December 31, 2016 from 4.65% as of December 31, 2015 to reflect market interest-rate conditions at December 31, 2016. A 25 basis point decrease in the assumed discount rate would have increased total net periodic pension expense for 2016 by approximately \$735,000, or 17.8%, and would have increased the projected benefit obligation (“PBO”) and accumulated benefit obligation (“ABO”) at December 31, 2016 by a total of \$6.7 million, or 3.7%. A 25 basis point decrease in the long-term return on pension plan asset assumption would have increased 2016 pension cost by approximately \$351,000, or 8.5%.

In addition, changes in the fair value of plan assets will impact future pension cost and the Plan’s funded status. Volatile market conditions can affect the value of AWR’s trust established to fund its future long-term pension benefits. Any reductions in the value of plan assets will result in increased future expense, an increase in the underfunded position and increased future contributions.

Previous CPUC decisions in the water and electric general rate cases have authorized GSWC to continue using a two-way balancing account to track differences between the forecasted annual pension expenses adopted in rates and the actual annual expense to be recorded by GSWC in accordance with the accounting guidance for pension costs. As of December 31, 2016, GSWC has a net \$1.3 million under-collection in the two-way pension balancing accounts, consisting of a \$1.9 million under-collection related to the general office and water regions, and a \$617,000 over-collection related to BVES.

Funding requirements for qualified defined benefit pension plans are determined by government regulations. In establishing the contribution amount, Registrant has considered the potential impact of funding-rule changes under the Pension

Protection Act of 2006. Registrant contributes the minimum required contribution as determined by government regulations or the forecasted annual pension cost authorized by the CPUC and included in customer rates, whichever is higher. In accordance with this funding policy, for 2017 the pension contribution is expected to be approximately \$6.2 million. As previously discussed, any differences between the forecasted annual pension costs in rates and the actual pension costs are included in the two-way pension balancing accounts.

Additionally, our pension plan liabilities are sensitive to changes in interest rates. As interest rates decrease, thereby reducing returns, our liabilities increase, potentially increasing benefit expense and funding requirements. In addition, market factors can affect assumptions we use in determining funding requirements with respect to our pension plan. For example, a relatively modest change in our assumptions regarding discount rates can materially affect our calculation of funding requirements. To the extent that market data compels us to reduce the discount rate used in our assumptions, our benefit obligations could be materially increased.

Changes in demographics, including increased numbers of retirees or increases in life expectancy assumptions may also increase the funding requirements of our obligations related to the pension and other postretirement benefit plans. Mortality assumptions are a critical component of benefit obligation amounts and a key factor in determining the expected length of time for annuity payments. In 2014, the Society of Actuaries ("SOA") released new mortality tables for pension plans. Beginning with 2014, the benefit obligation amounts assume a longer life expectancy of participants as a result of the actuarial update to mortality tables. In 2016, the SOA published updated mortality tables reflecting three additional years of data and refined certain parameters used in developing the 2014 tables. Accordingly, as of December 31, 2016, the benefit obligation amounts reflect updates to the 2014 mortality tables. The updates to the mortality tables, as compared to those used prior to 2014, are expected to increase future annual net periodic costs. Assuming no other changes in actuarial assumptions or plan amendments, the costs over the long term are expected to decrease due to the closure of Registrant's defined benefit pension plan to new employees as of January 1, 2011. Employees hired or rehired after December 31, 2010 are eligible to participate in a defined contribution plan.

Liquidity and Capital Resources

AWR

Registrant's regulated business is capital intensive and requires considerable capital resources. A portion of these capital resources is provided by internally generated cash flows from operations. AWR anticipates that interest expense will increase in future periods due to the need for additional external capital to fund its construction program, and as market interest rates increase. AWR believes that costs associated with capital used to fund construction at GSWC will continue to be recovered through water and electric rates charged to customers.

AWR funds its operating expenses and pays dividends on its outstanding Common Shares primarily through dividends from GSWC. The ability of GSWC to pay dividends to AWR is restricted by California law. Under these restrictions, approximately \$206.3 million was available for GSWC to pay dividends to AWR on December 31, 2016. Approximately \$57.2 million was available for ASUS to pay dividends to AWR as of December 31, 2016 to the extent that the subsidiaries of ASUS are able to pay dividends in that amount to ASUS under applicable state laws.

When necessary, Registrant obtains funds from external sources in the capital markets and through bank borrowings. Access to external financing on reasonable terms depends on the credit ratings of AWR and GSWC and current business conditions, including that of the water utility industry in general as well as conditions in the debt and equity capital markets. AWR has access to a syndicated credit facility which expires in May 2018. In October 2016, AWR elected to increase the aggregate commitment as permitted under the terms of the facility agreement from \$100.0 million to \$150.0 million. AWR borrows under this facility and provides funds to its subsidiaries, including GSWC, in support of their operations. Any amounts owed to AWR for borrowings under this facility are included in inter-company payables on GSWC's balance sheet. The interest rate charged to GSWC and other affiliates is sufficient to cover AWR's interest cost under the credit facility. As of December 31, 2016, there were \$90.0 million of outstanding borrowings under this facility and \$9.9 million of letters of credit outstanding. As of December 31, 2016, AWR had \$50.1 million available to borrow under the credit facility.

In April 2016, Standard & Poor's Rating Services ("S&P") affirmed the A+ credit rating and stable outlook on both AWR and GSWC. S&P debt ratings range from AAA (highest rating possible) to D (obligation is in default). In December 2016, Moody's Investors Service ("Moody's") affirmed its A2 rating with a stable outlook for GSWC. Securities ratings are not recommendations to buy, sell or hold a security and are subject to change or withdrawal at any time by the rating agency. Registrant believes that AWR's sound capital structure and A+ credit rating, combined with its financial discipline, will enable AWR to access the debt and/or equity markets. However, unpredictable financial market conditions in the future may limit its access or impact the timing of when to access the market, in which case, Registrant may choose to temporarily reduce its capital spending. During 2017, Registrant's company-funded capital expenditures are estimated to be approximately \$110 - \$120 million. If needed, GSWC will issue long-term debt in the near future, depending on market conditions. The proceeds from the debt issuance would be used to pay down short term borrowings and fund a portion of capital expenditures.

AWR's ability to pay cash dividends on its Common Shares outstanding depends primarily upon cash flows from GSWC. AWR intends to continue paying quarterly cash dividends in the future, on or about March 1, June 1, September 1 and December 1, subject to earnings and financial conditions, regulatory requirements and such other factors as the Board of Directors may deem relevant. Registrant has paid dividends on its Common Shares for over 76 consecutive years. On January 31, 2017, AWR's Board of Directors approved a first quarter dividend of \$0.242 per share on AWR's Common Shares. Dividends on the Common Shares will be paid on March 1, 2017 to shareholders of record at the close of business on February 15, 2017.

AWR's Board of Directors approved a stock repurchase program in each of 2014 and 2015, authorizing AWR to repurchase up to 2.45 million shares of AWR's Common Shares. Under these programs, Registrant repurchased 1,905,000 and 545,000 Common Shares on the open market during 2015 and 2014, respectively. Both stock repurchase programs were completed in 2015. The repurchase programs were intended to enable AWR to achieve a consolidated shareholders' equity ratio as a percentage of total capitalization that is more reflective of the current CPUC-authorized equity ratio for GSWC and an equity ratio for ASUS that is more consistent with the government contracting industry.

Cash Flows from Operating Activities:

Cash flows from operating activities have generally generated sufficient cash to fund operating requirements, including a portion of construction expenditures, and pay dividends. Registrant's future cash flows from operating activities are expected to be affected by a number of factors, including utility regulation; infrastructure investment; maintenance expenses; inflation; compliance with environmental, health and safety standards; production costs; customer growth; per customer usage of water and electricity; weather and seasonality; conservation efforts; compliance with local governmental

requirements, including mandatory restrictions on water use; and required cash contributions to pension and post-retirement plans. Cash flows are also affected by drought-related water conservation efforts by our customers. In addition, future cash flows from contracted services subsidiaries will depend on new business activities, existing operations, the construction of new and/or replacement infrastructure at military bases, timely redetermination, economic price and equitable adjustment of prices and timely collection of payments from the U.S. government and other prime contractors operating at the military bases.

Cash flows from operating activities are primarily generated by net income, adjusted for non-cash expenses such as depreciation and amortization, and deferred income taxes. Cash generated by operations varies during the year. Net cash provided by operating activities was \$96.9 million for the year ended December 31, 2016 as compared to \$95.1 million for the year ended December 31, 2015, and \$163.3 million for the year ended December 31, 2014. The increase was due to surcharges collected during 2016 for the 2015 WRAM under-collection, as well as lower WRAM under-collections recorded during 2016. This was partially offset by a decrease in cash generated by ASUS due to the timing of billing and cash receipts for construction work at military bases, as well as retroactive revenues collected during the year ended December 31, 2015 as compared to 2016. The billings (and cash receipts) for construction work at ASUS generally occur at completion of the work or in accordance with a billing schedule contractually agreed to with the U.S. government and/or other prime contractors. Cash flow from construction-related activities will fluctuate from period to period with such fluctuations representing timing differences of when the work is performed and when the cash is received for payment of such work. The timing of cash receipts and disbursements related to other working capital items also affected the changes in net cash provided by operating activities.

The decrease in operating cash flow during 2015 as compared to 2014 was due, in large part, to a decrease in customer water usage resulting from conservation efforts, which lowered customer billings at GSWC and increased the WRAM regulatory assets. There was also a decrease in cash generated by ASUS due to the timing of billing and cash receipts for construction work at military bases during the year ended December 31, 2015 as compared to the same period in 2014. During the year ended December 31, 2014, cash payments were received for the completion of several large capital upgrade projects that did not recur during the same period in 2015.

Cash Flows from Investing Activities:

Net cash used in investing activities was \$131.2 million for the year ended December 31, 2016 as compared to \$90.1 million used in 2015 and \$74.1 million used in 2014. The capital expenditures incurred in 2016 were consistent with GSWC's capital investment program approved in the water GRC, and were higher than in 2015. Capital expenditures during 2015 were higher than in 2014 due to project delays for several projects at GSWC in 2014 resulting from paving moratoriums, additional paving requirements imposed by local cities and a delay in drilling a well because suitable groundwater was not found in the area. Registrant expects 2017 company-funded capital expenditures to be \$110 - \$120 million.

Registrant invests capital to provide essential services to its regulated customer base, and has an opportunity to earn a fair rate of return on investment. Registrant's infrastructure investment plan consists of both infrastructure renewal programs, where infrastructure is replaced, as needed, and major capital investment projects, where new water treatment and delivery facilities are constructed. GSWC may also be required from time to time to relocate existing infrastructure in order to accommodate local infrastructure improvement projects. Projected capital expenditures and other investments are subject to periodic review and revision.

ASUS funds its operating expenses primarily through internal operating sources, which include U.S. government funding under 50-year contracts for operations and maintenance costs and construction activities, as well as loans from AWR. ASUS, in turn, provides funding to its subsidiaries.

Cash used for other investments consists primarily of cash invested in a trust for a retirement benefit plan.

Cash Flows from Financing Activities:

Registrant's financing activities include primarily: (i) the sale proceeds from, and repurchase of, Common Shares and stock option exercises and short-term and long-term debt; (ii) the issuance and repayment of long-term debt and notes payable to banks; and (iii) the payment of dividends on Common Shares. In order to finance new infrastructure, Registrant also receives customer advances (net of refunds) for, and contributions in aid of, construction. Short-term borrowings are used to fund capital expenditures until long-term financing is arranged.

Net cash provided from financing activities was \$30.3 million for the year ended December 31, 2016 as compared to cash used in financing activities of \$76.6 million and \$51.4 million for the same periods in 2015 and 2014, respectively. The increase in cash was due to an increase in short-term borrowings under Registrant's revolving credit line during 2016. The borrowings were used to fund operations and a portion of capital expenditures during 2016. There was also an increase in cash

receipts from advances for, and contributions in aid of, construction as compared to 2015. The amount of cash receipts from advances for, and contributions in aid of, construction will fluctuate from period to period depending on the level of activities from developers.

The cash used in financing activities during 2015 and 2014 was primarily due to the repurchase of approximately \$72.9 million and \$17.2 million, respectively, in AWR Common Shares as part of the stock repurchase programs approved by the Board of Directors. Additionally, GSWC repaid \$21.3 million of long-term debt, including the redemption of \$15 million in certain long-term notes, in 2014.

GSWC

GSWC funds the majority of its operating expenses, payments on its debt, and dividends on its outstanding common shares and a portion of its construction expenditures through internal sources. Internal sources of cash flow are provided primarily by retention of a portion of earnings from operating activities. Internal cash generation is influenced by factors such as weather patterns, conservation efforts, environmental regulation, litigation, deferred taxes, changes in supply costs and regulatory decisions affecting GSWC's ability to recover these supply costs, timing of rate relief, increases in maintenance expenses and capital expenditures, surcharges authorized by the CPUC to enable GSWC to recover expenses previously incurred from customers and CPUC requirements to refund amounts previously charged to customers. As previously discussed, GSWC has been authorized by the CPUC to track incremental drought-related costs incurred in a memorandum account for possible future recovery.

GSWC may, at times, utilize external sources, including equity investments and short-term borrowings from AWR, and long-term debt to help fund a portion of its construction expenditures. In addition, GSWC receives advances and contributions from customers, home builders and real estate developers to fund construction necessary to extend service to new areas. Advances for construction are generally refundable at a rate of 2.5% in equal annual installments over 40 years. Amounts which are no longer refundable are reclassified to contributions in aid of construction. Utility plant funded by advances and contributions is excluded from rate base. Generally, GSWC amortizes contributions in aid of construction at the same composite rate of depreciation for the related property.

As is often the case with public utilities, GSWC's current liabilities may at times exceed its current assets. Management believes that internally generated funds along with the proceeds from the issuance of long-term debt, borrowings from AWR and Common Shares issuances to AWR will be adequate to provide sufficient capital to enable GSWC to maintain normal operations and to meet its capital and financing requirements pending recovery of costs in rates.

Cash Flows from Operating Activities:

Net cash provided by operating activities was \$101.3 million for the year ended December 31, 2016 as compared to \$97.5 million and \$132.7 million for the same periods in 2015 and 2014, respectively. The increase was due to surcharges collected during 2016 for the 2015 WRAM under-collection, as well as lower WRAM under-collections recorded during 2016. The timing of cash receipts and disbursements related to working capital items affected the changes in net cash provided by operating activities.

The decrease in 2015 compared to 2014 is primarily due to a decrease in customer water usage resulting from conservation efforts, which lowered customer billings and increased the WRAM regulatory assets. This was partially offset by lower income tax payments made during 2015 mainly due to the implementation of new tax repair regulations during the fourth quarter of 2014.

Cash Flows from Investing Activities:

Net cash used in investing activities was \$129.3 million for the year ended December 31, 2016 as compared to \$89.0 million and \$72.0 million for the same periods in 2015 and 2014, respectively. As previously discussed, the capital expenditures incurred in 2016 and 2015 were consistent with GSWC's capital investment program. Capital expenditures were lower during 2014 due to project delays for several projects at GSWC. Registrant expects 2017 company-funded capital expenditures to be between \$110 and \$120 million. During the years ended December 31, 2016, 2015 and 2014, GSWC had capital expenditures of \$127.9 million, \$86.1 million and \$70.9 million, respectively.

During 2013, GSWC executed an interest-bearing note from AWR which expires in May 2018, whereby AWR may borrow up to \$20.0 million for working capital purposes. This amount was increased to \$40.0 million in 2015. During 2016, there were no amounts borrowed under this note. During 2015, AWR temporarily borrowed \$20.7 million from GSWC, all of

which was repaid during 2015. During 2014, AWR temporarily borrowed \$8.3 million from GSWC, all of which was repaid during 2014.

Cash Flows from Financing Activities:

Net cash provided from financing activities was \$25.7 million for the year ended December 31, 2016 as compared to cash used of \$50.0 million and \$54.6 million for the same periods in 2015 and 2014, respectively. The increase in cash provided by financing activities was due to an increase in proceeds from inter-company borrowings from AWR of \$49.5 million to fund operations and a portion of capital expenditures. There was also an increase in cash receipts from advances for, and contributions in aid of, construction as compared to 2015. The cash used by GSWC in financing activities during 2015 and 2014 was to pay dividends paid to AWR to help fund the stock repurchase programs. Additionally, GSWC repaid \$21.3 million of long-term debt, including the redemption of \$15 million in certain long-term notes, in 2014. These increases in cash used in financing activities were partially offset by proceeds from inter-company borrowings from AWR of \$12.0 million in 2015.

Contractual Obligations, Commitments and Off-Balance-Sheet Arrangements

Registrant has various contractual obligations which are recorded as liabilities in the consolidated financial statements. Other items, such as certain purchase commitments and operating leases are not recognized as liabilities in the consolidated financial statements, but are required to be disclosed. In addition to contractual maturities, Registrant has certain debt instruments that contain annual sinking fund or other principal payments. Registrant believes that it will be able to refinance debt instruments at their maturity through public issuance, or private placement, of debt or equity. Annual payments to service debt are generally made from cash flows from operations.

The following table reflects Registrant’s contractual obligations and commitments to make future payments pursuant to contracts as of December 31, 2016. All obligations and commitments are obligations and commitments of GSWC unless otherwise noted.

(\$ in thousands)	Payments/Commitments Due by Period (1)				
	Total	Less than 1 Year	1-3 Years	4-5 Years	After 5 Years
Notes/Debentures (2)	\$ 187,000	\$ —	\$ —	\$ —	\$ 187,000
Private Placement Notes (3)	123,000	—	40,000	—	83,000
Tax-Exempt Obligations (4)	11,632	143	290	324	10,875
Other Debt Instruments (5)	3,950	187	357	387	3,019
Total AWR Long-Term Debt	\$ 325,582	\$ 330	40,647	\$ 711	\$ 283,894
Interest on Long-Term Debt (6)	\$ 297,424	\$ 21,624	\$ 41,012	\$ 37,761	\$ 197,027
Advances for Construction (7)	73,025	3,331	6,662	6,662	56,370
Renewable Energy Credit Agreement (8)	3,550	382	845	1,085	1,238
Purchased Power Contracts (9)	18,062	6,717	11,250	95	—
Capital Expenditures (10)	41,309	41,309	—	—	—
Water Purchase Agreements (11)	5,270	409	818	818	3,225
Operating Leases (12)	8,645	2,451	3,786	1,688	720
Employer Contributions (13)	11,767	6,142	5,625	—	—
SUB-TOTAL	\$ 459,052	\$ 82,365	\$ 69,998	\$ 48,109	\$ 258,580
Other Commitments (14)	104,333				
TOTAL	\$ 888,967				

(1) Excludes dividends and facility fees.

(2) The notes and debentures have been issued by GSWC under an Indenture dated September 1, 1993, as amended in December 2008. The notes and debentures do not contain any financial covenants that Registrant believes to be material or any cross default provisions.

(3) GSWC issued private placement notes in the amount of \$28 million pursuant to the terms of note purchase agreements with substantially similar terms. These agreements contain restrictions on the payment of dividends, minimum interest coverage requirements, a maximum debt-to-capitalization ratio and a negative pledge. Pursuant to the terms of these agreements, GSWC must maintain a minimum interest coverage ratio of two times interest expense. In addition, two senior notes in the amount of \$40 million each were issued by GSWC in October 2005 and in March 2009 to CoBank, ACB. A senior note in the amount of \$15 million was issued to The Prudential Insurance Company of America in December 2014. Under the terms of these senior notes, GSWC may not incur any additional debt or pay any distributions to its shareholders if, after giving effect thereto, it would have a debt to capitalization ratio in excess of 0.6667-to-1 or a debt to Earnings Before Interest, Taxes, Depreciation and Amortization (“EBITDA”) ratio of more than 8-to-1. GSWC is in compliance with these covenant provisions as of December 31, 2016. GSWC does not currently have any outstanding mortgages or other liens on indebtedness on its properties.

(4) Consists of obligations at GSWC related to (i) a loan agreement supporting \$7.7 million in outstanding debt issued by the California Pollution Control Financing Authority, and (ii) \$3.9 million of obligations with respect to GSWC's 500 acre-foot

entitlement to water from the State Water Project ("SWP"). These obligations do not contain any financial covenants believed to be material to Registrant or any cross default provisions. In regards to its SWP entitlement, GSWC has entered into agreements with various developers for a portion of its 500 acre-foot entitlement to water from the SWP.

(5) Consists of (i) \$3.9 million outstanding representing the debt portion of funds received under the American Recovery and Reinvestment Act ("ARRA") for reimbursements of capital costs related to the installation of meters for conversion of non-metered service to metered service in GSWC's Arden-Cordova District, and (ii) \$54,000 outstanding under a variable rate obligation of GSWC incurred to fund construction of water delivery facilities with the Three Valleys Municipal Water District. These obligations do not contain any financial covenants believed to be material to Registrant or any cross default provisions.

(6) Consists of expected interest expense payments based on the assumption that GSWC's long-term debt remains outstanding until maturity. Current interest rates were used to estimate expected interest expense payments on variable-rate long-term debt.

(7) Advances for construction represent annual contract refunds by GSWC to developers for the cost of water systems paid for by the developers. The advances are generally refundable in equal annual installments over 40-year periods.

(8) Consists of an agreement by GSWC to purchase a total of 582,000 renewable energy credits through 2023. These renewable energy credits are used by GSWC's electric division to meet California's renewables portfolio standard.

(9) Consists of fixed-cost purchased power contracts effective January 1, 2015 between BVES and Shell Energy North America (US), L.P. and EDF Trading North America, LLC.

(10) Consists of capital expenditures estimated to be required under signed contracts at GSWC.

(11) Water purchase agreements consist of (i) a remaining amount of \$2.7 million under an agreement expiring in 2028 to lease water rights from a third party, and (ii) an aggregate amount of \$2.6 million of other water purchase commitments with other third parties which expire through 2038.

(12) Reflects future minimum payments under noncancelable operating leases for both GSWC and ASUS.

(13) Consists of expected contributions to Registrant's defined benefit pension plan for the years 2017 and 2018. Contribution to the pension plan will be the higher of the minimum required contribution under the Employee Retirement Income Security Act ("ERISA") or the amounts that are recovered in customer rates and approved by the CPUC. In December 2016, the CPUC approved the water general rate case that will set new rates for the years 2016 - 2018. These expected contributions are estimates and are consistent with the amounts included in customer rates. However, they are subject to change based on, among other things, the limits established for federal tax deductibility (pension plan) and the significant impact that returns on plan assets and changes in discount rates have on such amounts.

(14) Other commitments consist primarily of (i) a \$150.0 million syndicated revolving credit facility, of which \$90.0 million was outstanding as of December 31, 2016, (ii) a \$4.4 million asset retirement obligation of GSWC that reflects the retirement of wells by GSWC, which by law need to be properly capped at the time of removal, (iii) an irrevocable letter of credit in the amount of \$340,000 for the deductible in Registrant's business automobile insurance policy, (iv) an irrevocable letter of credit issued on behalf of GSWC in the amount of \$585,000 as security for the purchase of power by GSWC under an energy scheduling agreement with Automated Power Exchange, (v) \$5.4 million in letters of credit issued on behalf of GSWC representing a percentage of total ARRA funds received for reimbursement of capital costs related to the installation of meters for conversion of non-metered service to metered service in GSWC's Arden-Cordova district, (vi) a \$15,000 irrevocable letter of credit issued on behalf of GSWC pursuant to a franchise agreement with the City of Rancho Cordova, and (vii) an irrevocable letter of credit in the amount of \$3.6 million pursuant to a settlement agreement with Southern California Edison Company to cover GSWC's commitment to pay the settlement amount. All of the letters of credit are issued pursuant to the syndicated revolving credit facility. The syndicated revolving credit facility contains restrictions on prepayments, disposition of property, mergers, liens and negative pledges, indebtedness and guaranty obligations, transactions with affiliates, minimum interest coverage requirements, a maximum debt-to-capitalization ratio, and a minimum debt rating. Pursuant to the credit agreement, AWR must maintain a minimum interest coverage ratio of 3.25 times interest expense, a maximum total funded debt ratio of 0.65-to-1.00 and a minimum debt rating from Moody's or S&P of Baa3 or BBB-, respectively. As of December 31, 2016, AWR was in compliance with these covenants with an interest coverage ratio of 7.07 times interest expense, a debt ratio of 0.46-to-1.00 and debt ratings of A+ and A2.

Off-Balance-Sheet Arrangements

As noted above, Registrant has various contractual obligations which are recorded as liabilities in the consolidated financial statements. Other items, such as certain purchase commitments and operating leases, are not recognized as liabilities in the consolidated financial statements, but are required to be disclosed. Except for those disclosed above in the table, Registrant does not have any other off-balance-sheet arrangements.

Effects of Inflation

The rates of GSWC are established to provide recovery of costs and a fair return on shareholders' investment. Recovery of the effects of inflation through higher water rates is dependent upon receiving adequate and timely rate increases. However, authorized rates charged to customers are usually based on a forecast of expenses and capital costs for GSWC. Rates may lag increases in costs caused by unanticipated inflation. During periods of moderate to low inflation, as has been experienced for the past several years, the effects of inflation on operating results have not been significant. Furthermore, the CPUC approves projections for a future test year in general rate cases which reduces the impact of inflation to the extent that GSWC's inflation forecasts are accurate.

For the Military Utility Privatization Subsidiaries, under the terms of the contracts with the U.S. government, the contract price is subject to (a) price redetermination every three years after the initial two years of the contract, unless otherwise agreed to by the parties, and include adjustments to reflect changes in operating conditions, as well as inflation in costs, or (b) an economic price adjustment on an annual basis. ASUS has experienced delays in some of its previous redetermination of prices. However, when adjustments are finalized, they are implemented retroactively to the effective date of the price redetermination.

Climate Change

Water:

Based on historical data for greenhouse gas ("GHG") emissions generated from its water operations, GSWC has developed a baseline carbon footprint. Annually, GSWC compares the GHG emissions generated by its water operations to this baseline as part of monitoring its carbon footprint and making efforts to reduce it. Additionally, GSWC's ongoing operations and maintenance activities include, among other things, pump-efficiency-testing programs to monitor the performance of its pumping facilities.

In addition, as part of the planning process, GSWC intends to continue to assess the possible impact climate change may have on its water supply and operations.

Electric:

California has established a cap-and-trade program applicable to GHG emissions. While BVES's power-plant emissions are below the reporting threshold, as a "Covered Entity" BVES has an obligation to file a report in June of each year under the program.

The CPUC has established renewable-energy-procurement-requirement timelines. BVES has entered into a ten-year contract for renewable energy credits that was approved by the CPUC. As a result of this agreement, BVES believes it will be in compliance with both the CPUC's past renewable-energy-procurement requirements and future requirements through at least 2019. However, in addition to a forecasted increase in sales, the passage of Senate Bill 350 in late 2015, includes extending and increasing the renewable energy procurement requirements beyond 2020. As a result, BVES will need to re-examine its renewable supply quantities to ensure continued compliance.

BVES is also required to comply with the CPUC's emission performance standards ("EPS") regarding GHG emissions. Under these standards, BVES must file an annual attestation with the CPUC stating that BVES is in compliance with the EPS. Specifically, BVES must attest to having no new ownership investment in generation facilities or no long-term commitments for generation. In February 2017, BVES filed with the CPUC stating that BVES was in compliance with the EPS for 2016.

At this time, management cannot estimate the impact, if any, that these regulations may have on the cost of BVES's power plant operations or the cost of BVES's purchased power from third party providers.

BVES Power-Supply Arrangements

BVES began taking power effective January 1, 2015 at a fixed cost over three and five year terms depending on the amount of power and period during which the power is purchased under contracts approved by the CPUC in December 2015. During 2014, BVES's power purchases were based on month-to-month arrangements, as the previous purchase power contract had expired in 2013.

In addition to the purchased power contracts, BVES buys additional energy to meet peak demand as needed and sells surplus power when necessary. The average cost of power purchased, including fixed costs and the transactions in the spot market, was approximately \$69.54 per MWh for the year ended December 31, 2016 as compared to \$68.21 per MWh for the same period of 2015. BVES's average energy costs are impacted by pricing fluctuations on the spot market. However, BVES has implemented an electric-supply-cost balancing account, as approved by the CPUC, to alleviate any impacts to earnings.

Construction Program

GSWC maintains an ongoing water distribution main replacement program throughout its customer service areas based on the age and type of distribution-system materials, priority of leaks detected, remaining productive life of the distribution system and an underlying replacement schedule. In addition, GSWC upgrades its electric and water supply facilities in accordance with industry standards, local requirements and CPUC requirements. As of December 31, 2016, GSWC has unconditional purchase obligations for capital projects of approximately \$41.3 million. During the years ended December 31, 2016, 2015 and 2014, GSWC had capital expenditures of \$126.0 million, \$95.5 million and \$65.4 million, respectively. A portion of these capital expenditures is funded by developers through advances, which must be repaid, or contributions in aid of construction, which are not required to be repaid. During the years ended December 31, 2016, 2015 and 2014, capital expenditures funded by developers were \$5.3 million, \$4.4 million and \$4.6 million, respectively. During 2017, GSWC's company-funded capital expenditures are estimated to be approximately \$110 - \$120 million.

Contracted Services

Under the terms of the current utility privatization contracts with the U.S. government, each contract's price is subject to (a) price redetermination every three years after the initial two years of the contract, unless otherwise agreed to by the parties, or (b) an economic price adjustment ("EPA") on an annual basis. The ECUS contract and all other new contracts will be economic-price-adjustment contracts. In the event that ASUS (i) is managing more assets at specific military bases than were included in the U.S. government's request for proposal, (ii) is managing assets that are in substandard condition as compared to what was disclosed in the request for proposal, (iii) prudently incurs costs not contemplated under the terms of the utility privatization contract, and/or (iv) becomes subject to new regulatory requirements, such as more stringent water-quality standards, ASUS is permitted to file, and has filed, requests for equitable adjustment ("REA"). The timely filing for and receipt of price redeterminations, EPAs and/or REAs continues to be critical in order for the Military Utility Privatization Subsidiaries to recover increasing costs of operating and maintaining, and renewing and replacing the water and/or wastewater systems at the military bases it serves.

Under the Budget Control Act of 2011 (the "Act"), substantial automatic spending cuts, known as "sequestration," have impacted the expected levels of Department of Defense budgeting. The Military Utility Privatization Subsidiaries have not experienced any earnings impact to their existing operations and maintenance and renewal and replacement services, as utility privatization contracts are an "excepted service" within the Act. While the ongoing effects of sequestration have been mitigated through the passage of a continuing resolution for the fiscal year 2017 Department of Defense budget, similar issues may arise as part of fiscal uncertainty and/or future debt-ceiling-limits imposed by Congress. However, any future impact on ASUS and its operations through the Military Utility Privatization Subsidiaries will likely be limited to the timing of funding to pay for services rendered, delays in the processing of price redeterminations, EPAs and/or REAs, issuance of contract modifications for new construction work not already funded by the U.S. government, and/or delays in the solicitation and/or awarding of new utility privatization opportunities under the Department of Defense utility privatization program.

The timing of future filings of price redeterminations and/or EPAs may be impacted by government actions, including audits or reviews by the Defense Contract Audit Agency ("DCAA") and/or the Defense Contract Management Agency ("DCMA"). Both DCAA and DCMA may conduct, at the request of a contracting officer, audits/reviews of contractors for compliance with government guidance and regulations such as Federal Acquisition Regulations ("FAR"), Defense Federal Acquisition Regulation Supplements ("DFARS") and, as applicable, Cost Accounting Standards ("CAS"). If the DCAA/DCMA believes ASUS and/or the Military Utility Privatization Subsidiaries have accounted for costs in a manner inconsistent with the requirements of FAR, DFARS or applicable CAS, the auditor may recommend to the U.S. government administrative contracting officer that such costs be disallowed. In addition, certain audit findings such as system deficiencies for

government-contract-business-system requirements may result in delays in the timing of resolution of price redetermination and/or EPA filings and/or the ability to file new proposals with the U.S. government.

Below is a summary of price redetermination, EPA, and REA filings by the Military Utility Privatization Subsidiaries. ASUS is current on all price redetermination and EPA filings for contracts at all of the Military Utility Privatization Subsidiaries.

- **FBWS** - The fourth price redetermination for Fort Bliss, beginning October 1, 2015 and converting to an EPA beginning October 1, 2016, has been agreed to by the contracting officer and a contract modification is expected to be issued in the first quarter of 2017.
- **TUS** - The EPA for Andrews Air Force Base, covering the period February 2017 through January 2018, was submitted to the government in the fourth quarter of 2016 and provides for an annualized inflationary increase in operations and maintenance and renewal and replacement fees. This filing is expected to be resolved in the first quarter of 2017.
- **ODUS** - The EPA for the Fort Lee privatization contract in Virginia, covering the one-year period beginning February 2016, was finalized in the third quarter of 2016. The EPA for the other bases that ODUS operates in Virginia, covering the one-year period beginning April 2016, was finalized through the issuance of contract modifications in June 2016. REA filings were made in 2015 to recover costs associated with work done at Joint-Base Langley Eustis, VA, under a new capital upgrade project. The requests covered work that was approved to be performed by the base and involved additional revenue totaling \$630,000. These REA's are expected to be resolved in the third quarter of 2017.
- **PSUS** - The third redetermination for Fort Jackson, covering the period mid-February 2016 through mid-February 2017 and converting to an EPA effective February 2017, was finalized in the third quarter of 2016.
- **ONUS** - The third price redetermination for Fort Bragg, covering the period March 2016 through February 2019, was filed in March 2016 and is expected to be resolved in the first quarter of 2017.
ONUS filed an REA to obtain funding for additional work to be performed in an historical area of Fort Bragg in September 2016. It is expected that this REA will be resolved in the second quarter of 2017.

New Privatization Contract Award:

On July 12, 2016, ASUS was awarded a 50-year contract by the U.S. government to operate, maintain, and provide construction services for the water and wastewater systems at Eglin Air Force Base located in Florida. The initial value of the contract is estimated at approximately \$510 million over the 50-year period and is subject to annual economic price adjustments. This initial value is subject to adjustment based on the results of a joint inventory of assets, which is currently underway. ASUS will assume operations at Eglin Air Force Base in the spring of 2017 following the completion of a transition period currently underway.

Regulatory Matters

Certificates of Public Convenience and Necessity

GSWC holds Certificates of Public Convenience and Necessity (“CPCN”) granted by the CPUC in each of the ratemaking areas it serves. ASUS is regulated, if applicable, by the state in which it primarily conducts water and/or wastewater operations. FBWS holds a CPCN from the Public Utilities Commission of Texas. The Virginia State Corporation Commission exercises jurisdiction over ODUS as a public service company. The Maryland Public Service Commission approved the right of TUS to operate as a water and wastewater utility at Joint Base Andrews, Maryland, based on certain conditions. The South Carolina Public Service Commission exercises jurisdiction over PSUS as a public service company. ONUS is regulated by the North Carolina Public Service Commission.

Rate Regulation

GSWC is subject to regulation by the CPUC, which has broad authority over service and facilities, rates, classification of accounts, valuation of properties, the purchase, disposition and mortgaging of properties necessary or useful in rendering public utility service, the issuance of securities, the granting of certificates of public convenience and necessity as to the extension of services and facilities and various other matters.

Rates that GSWC is authorized to charge are determined by the CPUC in general rate cases and are derived using rate base, cost of service and cost of capital, as projected for a future test year. Rates charged to customers vary according to customer class and rate jurisdiction and are generally set at levels allowing for recovery of prudently incurred costs, including a fair return on rate base. Rate base generally consists of the original cost of utility plant in service, plus certain other assets, such as working capital and inventory, less accumulated depreciation on utility plant in service, deferred income tax liabilities and certain other deductions.

GSWC is required to file a water general rate case (“GRC”) application every three years according to a schedule established by the CPUC. GRCs typically include an increase in the first test year with inflation-rate adjustments for expenses for the second and third years of the GRC cycle. For capital projects, there are two test years. Rates are based on a forecast of expenses and capital costs for each test year. Electric GRCs are typically filed every four years.

Rates may also be increased by offsets for certain expense increases, including, but not limited to, supply-cost offset and balancing-account amortization, advice letter filings related to certain plant additions and other operating cost increases.

Neither the operations nor rates of AWR and ASUS are directly regulated by the CPUC. The CPUC does, however, regulate certain transactions between GSWC and ASUS and between GSWC and AWR.

Changes in Rates for 2016 and 2017

On December 15, 2016, the CPUC approved a decision in the water GRC for GSWC. GSWC filed a general rate case application in July 2014 for all of its water ratemaking areas and the general office to determine new rates for the years 2016, 2017 and 2018. The new rates approved by the CPUC in the December 15 decision are retroactive to January 1, 2016. However, because of the delay in issuing a decision, the CPUC has ordered GSWC to bypass implementing 2016 rates and to implement 2017 rates once the CPUC has corrected some minor rate calculations in the December 15 decision. Any revenue shortfall due to differences between the actual rates charged in 2016 while the decision was still pending and the final 2016 rates adopted in the December 15 decision will be recovered in a rate surcharge. Once the CPUC approves the minor corrections, the adopted revenue in 2017 is expected to increase by \$2.8 million as compared to 2016 with rates retroactively effective January 1, 2017.

Based on the CPUC decision issued in December, the 2016 adopted revenues were lower than in 2015 due to reductions in: (i) supply costs caused by lower consumption, (ii) depreciation expense resulting from an updated depreciation study, and (iii) other operating expenses. Among other things, the final decision also authorized 87% of GSWC’s capital requests in customer rates, allowed only a portion of the executive incentive programs, approved recovery for certain expenses incurred in prior years that were being tracked in CPUC-authorized memorandum accounts, and adopted sales levels which reflect state-mandated conservation targets that were imposed by the governor of California during the processing of the application. The CPUC also authorized a sales adjustment mechanism for the 2017 and 2018 escalation years, which adjusts adopted WRAM-related sales levels if there is a 10% or more variance (positive or negative) between actual and adopted usage. If actual WRAM-related sales in a given year differ by 10% or more of the adopted WRAM-related sales, the following year’s adopted WRAM-related sales are adjusted by one half of the difference. Based on 2016 actual sales, the sales adjustment

mechanism was triggered in three of GSWC's ratemaking areas, resulting in a downward adjustment to those ratemaking areas' adopted 2017 WRAM-related sales.

In March 2016, the CPUC issued a decision granting a request filed by GSWC to defer BVES's next GRC filing to March 2017. The next GRC filing will be for years 2018 through 2021. Adopted base revenues for 2017 will be based on 2016 adopted base revenues.

Cost of Capital Proceedings for Water Regions

In July 2012, the CPUC issued a decision on GSWC's water cost-of-capital proceeding. Among other things, the decision authorized GSWC to continue the Water Cost of Capital Mechanism ("WCCM"). The WCCM adjusts return on equity ("ROE") and rate of return on rate base between the three-year cost of capital proceedings only if there is a positive or negative change of more than 100 basis points in the average of the Moody's Aa utility bond rate as measured over the period October 1 through September 30. If the average Moody's rate for this period changes by over 100 basis points from the benchmark, the ROE will be adjusted by one half of the difference. Since 2012, there has not been a change by more than 100 basis points from the benchmark. As a result, GSWC's current water ROE of 9.43% remained unchanged through 2016. GSWC is scheduled to file its next cost-of-capital application in March 2017 based on an extension previously granted.

Nipomo Supplemental Water Project

In November 2015, GSWC filed an application to recover the costs of a water supply project intended to deliver water to the Nipomo Mesa area in GSWC's Santa Maria ratemaking area. In February 2016, GSWC and the CPUC's Office of Ratepayer Advocates ("ORA") jointly filed a motion to adopt a settlement, which resolved all of the cost-recovery issues in GSWC's application. In September 2016, the CPUC issued a final decision approving the settlement. Furthermore, the costs of this water project have been included in the CPUC's final decision on the water GRC and were included in Santa Maria's rates retroactive to January 1, 2016.

Other Regulatory Matters

New Service Territory Application, Sutter County:

On June 26, 2014, the CPUC approved a Certificate of Public Convenience and Necessity ("CPCN") application granting GSWC the authority to provide water utility services to an area to be developed near Sacramento, in Sutter County, California, called Sutter Pointe. The CPUC's decision approved a settlement that was jointly filed by GSWC, Sutter County, the Sutter Pointe Developers, and a coalition of Sutter County residents. With the CPUC's approval, GSWC will create a water service district to supply the Sutter Pointe development with groundwater and surface water from the Sacramento River. The project will involve the construction of underground infrastructure and groundwater wells with a treatment plant and storage facility to serve retail, industrial and approximately 17,000 residential customers at final build-out. The decision also sets a cap on the revenue requirement per Sutter Pointe customer during the first two rate cycles. In August 2014, ORA filed an application for rehearing on the CPCN application in regard to the rate cap adopted by the CPUC. In September 2016, the CPUC adopted a settlement reached between GSWC and ORA, which modified the rate cap.

New Service Territory Application, Westborough Development, Sacramento County:

On October 12, 2004, GSWC and Aerojet-General Corporation ("Aerojet") reached a settlement relating to groundwater contamination impacting GSWC's Arden-Cordova Water System. Portions of the settlement called for GSWC to serve new territory, subject to CPUC approval, on property owned by Aerojet known as Westborough. Aerojet and GSWC have been working cooperatively to identify and implement the best alternative to meet the long-term water supply needs of GSWC's Rancho Cordova customers within the Arden-Cordova service area. In August 2016, GSWC entered into agreements with Aerojet and Carmichael Water District (CWD) to provide GSWC with 5000 acre feet per year of treated water from CWD's Bajamont Water Treatment Plant for GSWC's Rancho Cordova customers within the Arden-Cordova service area. GSWC will begin taking delivery of this water in 2017. GSWC and Aerojet will continue to work cooperatively to identify the necessary water resources for the new Westborough development area owned by Aerojet. The County of Sacramento and the City of Folsom, through various arrangements, have agreed not to protest GSWC's application to the CPUC for a CPCN for this territory.

GSWC intends to file with the CPUC to incorporate the Westborough development in Sacramento County into the Rancho Cordova service area and to provide water service to that new development following completion of a water supply solution for the area.

Balanced Rates Order Instituting Rulemaking:

In April 2015, the CPUC issued a ruling establishing a second phase to its on-going rulemaking addressing the CPUC's Water Action Plan objective of setting rates that balance investment, conservation, and affordability. The intended purpose of the second phase is to review the CPUC's water-conservation rate structure, tiered rates, forecasting methods, accounting mechanisms and other standards and programs that guide investor-owned water utility rates, charges, and cost recovery. In December 2016, the CPUC issued a final decision on this objective. Among other things, the final decision retains the WRAM mechanism, and orders Class A California water companies to consider: (i) a sales reconciliation mechanism to adjust forecasted water consumption authorized by the CPUC based on actual consumption, (ii) changing tiered rates to include a very high tiered rate and a super user charge aimed at high-usage customers, (iii) implementing advanced metering infrastructure for all customers, and (iv) shifting more revenue recovery through monthly fixed charges versus quantity charges. GSWC will consider these recommendations as part of its next GRC filing in 2017.

For more information regarding significant regulatory matters, see Note 2 of "*Notes to Financial Statements*" included in Part II, Item 8, in Financial Statements and Supplementary Data.

Environmental Matters

AWR's subsidiaries are subject to stringent environmental regulations, including the 1996 amendments to the Federal Safe Drinking Water Act.

GSWC is required to comply with the safe drinking water standards established by the U.S. Environmental Protection Agency ("EPA") and the Division of Drinking Water ("DDW"), under the State Water Resources Control Board ("SWRCB"). The EPA regulates contaminants that may have adverse health effects that are known or likely to occur at levels of public health concern, and the regulation of which will provide a meaningful opportunity for health risk reduction. The DDW, acting on behalf of the EPA, administers the EPA's program in California. Similar state agencies administer these rules in the other states in which Registrant operates.

GSWC currently tests its water supplies and water systems according to, among other things, requirements listed in the Federal Safe Drinking Water Act ("SDWA"). GSWC works proactively with third parties and governmental agencies to address issues relating to known contamination threatening GSWC water sources. GSWC also incurs operating costs for testing to determine the levels, if any, of the constituents in its sources of supply and additional expense to treat contaminants in order to meet the federal and state maximum contaminant level ("MCL") standards and consumer demands. GSWC expects to incur additional capital costs as well as increased operating costs to maintain or improve the quality of water delivered to its customers in light of anticipated stress on water resources associated with watershed and aquifer pollution, as well as to meet future water quality standards and consumer expectations. The CPUC ratemaking process provides GSWC with the opportunity to recover prudently incurred capital and operating costs in future filings associated with achieving water quality standards. Management believes that such incurred and expected future costs should be authorized for recovery by the CPUC.

Matters Relating to Environmental Cleanup

GSWC has been involved in environmental remediation and cleanup at a plant site ("Chadron Plant") that contained an underground storage tank which was used to store gasoline for its vehicles. This tank was removed from the ground in July 1990 along with the dispenser and ancillary piping. Since then, GSWC has been involved in various remediation activities at this site.

As of December 31, 2016, the total spent to cleanup and remediate GSWC's plant facility was approximately \$5.2 million, of which \$1.5 million has been paid by the State of California Underground Storage Tank Fund. Amounts paid by GSWC have been included in rate base and approved by the CPUC for recovery. As of December 31, 2016, GSWC has a regulatory asset and an accrued liability for the estimated additional cost of \$1.4 million to complete the cleanup at the site. The estimate includes costs for two years of continued activities of groundwater cleanup and monitoring, future soil treatment, and site closure related activities. The ultimate cost may vary as there are many unknowns in remediation of underground gasoline spills and this is an estimate based on currently available information. Management also believes it is probable that the estimated additional costs will be approved in rate base by the CPUC.

Matters Relating to Military Privatization Contracts

Each of the Military Utility Privatization Subsidiaries is responsible for testing the water and wastewater systems on the military bases on which it operates in accordance with applicable law.

Each of the Military Utility Privatization Subsidiaries has the right to seek an equitable adjustment to its contract in the event that there are changes in environmental laws, a change in the quality of water used in providing water service or wastewater discharged by the U.S. government or contamination of the air or soil not caused by the fault or negligence of the Military Utility Privatization Subsidiary. These changes can impact operations and maintenance and renewal and replacement costs under the contracts. The U.S. government is responsible for environmental contamination due to its fault or negligence and for environmental contamination that occurred prior to the execution of a contract.

Security Issues

GSWC has security systems and infrastructure in place intended to prevent cyber-attacks. Despite its efforts, GSWC cannot be assured that a cyber or terrorist attack will not cause water or electric system problems, disrupt service to customers, compromise important data or systems or result in unintended release of customer or employee information.

GSWC periodically revises its Emergency Preparedness Plan and periodically conducts operational emergency exercises for all of its water systems. GSWC also considers advances in security and emergency preparedness technology and relevant industry developments in developing its capital-improvement plans. GSWC intends to seek approval of the CPUC to recover any additional costs that it incurs in enhancing the security, reliability and resiliency of its water systems.

The Military Utility Privatization Subsidiaries operate facilities within the boundaries of military bases which provide limited access to the general public. To further enhance security, in prior years, certain upgrades were completed at various military bases through contract modifications funded by the U.S. government.

Registrant has evaluated its cyber-security systems and is addressing identified areas of improvement with respect to U.S. government regulations regarding cyber-security of government contractors. These improvements include the physical security at all of the office and employee facilities it operates. Registrant anticipates it will be in full compliance with these regulations by the mandated December 31, 2017 deadline.

California Drought

In response to the ongoing drought experienced in California, the SWRCB has taken various actions to ensure reduced water usage throughout the State, and to track reductions by larger urban water suppliers. GSWC has filed appropriate drought contingency plans, or Staged Mandatory Water Conservation and Rationing Plan, with the CPUC to meet the SWRCB requirements. GSWC's water usage reductions have met the SWRCB requirements.

California's ongoing period of drought has resulted in reduced recharge to the state's groundwater basins. GSWC utilizes groundwater from numerous groundwater basins throughout the state. Several of these basins, especially smaller basins, are experiencing dropping groundwater levels. Several of GSWC's service areas rely on groundwater as their only source of supply. Given the critical nature of the groundwater levels in the Central Coast area, GSWC has implemented mandatory water restrictions in certain service areas, moving to higher stages of the Staged Mandatory Water Conservation and Rationing Plan for those areas. Precipitation during January 2017 has been above average for much of the State and may indicate more normal hydrology for 2017. However, should dry conditions persist through the remainder of 2017, areas served by these smaller basins may experience further mandatory conservation measures in the future. In the event of water supply shortages beyond the mandated reductions, GSWC would need to transport additional water from other areas, increasing the cost of water supply.

As of February 14, 2017, the U.S. Drought Monitor estimates approximately 7 percent of California in the rank of "Severe Drought," which is a significant improvement from January 2016 when 86 percent was ranked "Severe Drought."

GSWC's Water Supply

During 2016, GSWC delivered approximately 59,858,000 hundred cubic feet ("ccf") of water to its customers, which is an average of about 376 acre-feet per day. An acre-foot is approximately 435.6 ccf or 326,000 gallons. Approximately 55% of GSWC's supply came from groundwater production wells situated throughout GSWC's service areas. Approximately 45% of GSWC's supply came from wholesale purchases from Metropolitan Water District of Southern California ("MWD") member agencies and other regional water suppliers (roughly 40% of total demand) or from authorized diversions from rivers (roughly 5%) under contracts with the United States Bureau of Reclamation ("Bureau") and the Sacramento Municipal Utility District

("SMUD"). During 2015, GSWC supplied 58,848,000 ccf of water, approximately 65% of which was produced from groundwater sources and 35% was purchased from regional wholesalers or surface water diversions under contracts with the Bureau and SMUD. GSWC continually assesses its water rights and groundwater storage assets.

Groundwater

Groundwater resources play an important role in California, and in GSWC's water supply portfolio specifically. Over the years, increased demands on groundwater resources have resulted in both cooperative and judicially enforced regimes ("adjudicated basins") for managing groundwater basins for long-term sustainability. The 2014 Sustainable Groundwater Management Act established authority for the California Department of Water Resources ("DWR") to, among other things, establish and revise existing basin boundaries and establish regulations to implement Groundwater Sustainability Plans ("GSP") with the objective of improving basin management. The SWRCB has been given authority, among other things, to assist in the establishment of Groundwater Sustainability Agencies ("GSA") for the purpose of developing GSPs, and intervene if local efforts are not successful in the creation of GSAs or GSPs. Adjudicated basins are considered low-priority for further action given they are generally well managed, and it is expected that existing rules governing adjudicated basins will remain in effect. GSWC intends to cooperate to the fullest extent allowed in the development of these GSAs and GSPs in unadjudicated basins from which it pumps to protect its interests in proper management of these groundwater basins. GSWC owns approximately 86,000 acre-feet of adjudicated groundwater and surface water rights, and a number of unadjudicated water rights to help meet supply requirements.

The productivity of GSWC's groundwater resources varies from year to year depending upon a variety of factors, including the amount, duration, length and location of rainfall, the availability of imported replenishment water, the amount of water previously stored in groundwater basins, the amount and seasonality of water use by GSWC's customers and others, evolving challenges to water quality, and a variety of legal limitations on use, if a groundwater basin is, or may be, in an over-drafted condition. GSWC management actively participates in efforts to protect groundwater basins from over-use and from contamination and to protect its water rights. In some periods, these efforts require reductions in groundwater pumping and increased reliance on alternative water resources.

State Water Project

The California State Water Project ("SWP") is a water storage and delivery system operated and maintained by DWR for purposes of delivery of water supplies primarily for urban and agricultural purposes to SWP contract holders. Every year, the DWR establishes the SWP allocation for water deliveries to the state water contractors. DWR generally establishes a percentage allocation of delivery requests based on a number of factors, including weather patterns, snow-pack levels, reservoir levels and biological diversion restrictions. DWR set the delivery allocation at 60% of requests in January 2017. GSWC takes delivery of SWP via water wholesale agencies.

Imported Water

GSWC also manages a portfolio of water supply arrangements with water wholesalers who may import water from outside the immediate service area. For example, GSWC has contracts with various governmental entities (principally MWD's member agencies) and other parties to purchase water through a total of 64 connections for distribution to customers, in addition to numerous emergency connections. MWD is a public agency organized and managed to provide a supplemental, imported supply to its member public agencies. There are 26 such member agencies, consisting of 14 cities, 11 municipal water districts and one county water authority. GSWC has 46 connections to MWD's water distribution facilities and those of member agencies. GSWC purchases MWD water through six separate member agencies aggregating 47,800 acre-feet annually. MWD's principal source of water is the SWP and the Colorado River via the Colorado River Aqueduct.

GSWC has contracts to purchase water or water rights for an aggregate amount of \$5.3 million as of December 31, 2016. Included in the \$5.3 million is a remaining commitment of \$2.7 million under an agreement with the City of Claremont ("the City") to lease water rights that were ascribed to the City as part of the Six Basins adjudication. The initial term of the agreement expires in 2028. GSWC can exercise an option to renew this agreement for 10 additional years. The remaining \$2.6 million are commitments for purchased water with other third parties which expire through 2038.

Potential Additional Sources of Supply

GSWC continues to assess additional water supply opportunities to expand and firm up its water supply portfolio for service to customers. GSWC is actively pursuing participation in desalination proposals with Poseidon Resources, imported supplies via Cadiz Inc., as well as various recycled water opportunities.

Military Utility Privatization Subsidiaries

The U.S. government is responsible for providing the source of supply for all water on each of the bases served by the Military Utility Privatization Subsidiaries at no cost to the Military Utility Privatization Subsidiaries. Once received from the U.S. government, ASUS is responsible for ensuring the continued compliance of the provided source of supply with all Federal, State and local regulations.

New Accounting Pronouncements

Registrant is subject to newly issued requirements as well as changes in existing requirements issued by the Financial Accounting Standards Board. Differences in financial reporting between periods could occur unless and until the CPUC approves such changes for conformity through regulatory proceedings. See *Note 1 of Notes to Consolidated Financial Statements*.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Registrant is exposed to certain market risks, including fluctuations in interest rates, and commodity price risk primarily relating to changes in the market price of electricity. Market risk is the potential loss arising from adverse changes in prevailing market rates and prices.

Interest Rate Risk

A significant portion of Registrant's capital structure is comprised primarily of fixed-rate debt. Market risk related to our fixed-rate debt is deemed to be the potential increase in fair value resulting from a decrease in interest rates. At December 31, 2016, the fair value of Registrant's long-term debt was \$423.1 million. A hypothetical ten percent decrease in market interest rates would have resulted in a \$16.6 million increase in the fair value of Registrant's long-term debt.

Market risk related to Registrant's variable-rate debt is estimated as the potential decrease in pretax earnings resulting from an increase in interest rates. As of December 31, 2016, Registrant had \$54,000 in variable-interest-rate debt outstanding. A hypothetical one percent rise in interest rates would not result in a material impact to earnings.

At December 31, 2016, Registrant did not believe that its short-term debt was subject to interest-rate risk due to the fair market value being approximately equal to the carrying value.

Commodity/Derivative Risk

BVES is exposed to commodity price risk primarily relating to changes in the market price of electricity. To manage its exposure to energy price risk, BVES from time to time executes purchased power contracts that qualify as derivative instruments, requiring mark-to-market derivative accounting under the accounting guidance for derivatives. A derivative financial instrument or other contract derives its value from another investment or designated benchmark.

In December 2014, the CPUC approved an application, which allowed BVES to immediately execute long-term purchased power contracts with energy providers, which became effective on January 1, 2015. BVES began taking power under these long-term contracts at a fixed cost over three and five year terms depending on the amount of power and period during which the power is purchased under the contracts.

The long-term contracts executed in December 2014 qualify for derivative accounting treatment. Among other things, the CPUC approval in December 2014 also authorized BVES to establish a regulatory asset and liability memorandum account to offset the mark-to-market entries required by the accounting guidance. Accordingly, all unrealized gains and losses generated from these purchased power contracts are deferred on a monthly basis into a non-interest bearing regulatory memorandum account that tracks the changes in fair value of the derivative throughout the term of the contract. As a result, the unrealized gains and losses on these contracts do not impact BVES's earnings. As of December 31, 2016, there was a \$4.9 million unrealized loss in the memorandum account for the new purchased power contracts as a result of a drop in energy prices since the execution of the contract.

Except as discussed above, Registrant has had no other derivative financial instruments, financial instruments with significant off-balance sheet risks or financial instruments with concentrations of credit risk.

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**AMERICAN STATES WATER COMPANY
CONSOLIDATED BALANCE SHEETS**

(in thousands)	December 31,	
	2016	2015
Assets		
Utility Plant		
Regulated utility plant, at cost:		
Water	\$ 1,514,419	\$ 1,428,024
Electric	94,009	88,481
Total	1,608,428	1,516,505
Non-regulated utility property, at cost	11,897	11,032
Total utility plant, at cost	1,620,325	1,527,537
Less — accumulated depreciation	(532,753)	(529,698)
	1,087,572	997,839
Construction work in progress	63,354	62,955
Net utility plant	1,150,926	1,060,794
Other Property and Investments		
Goodwill	1,116	1,116
Other property and investments	20,836	18,710
Total other property and investments	21,952	19,826
Current Assets		
Cash and cash equivalents	436	4,364
Accounts receivable-customers, less allowance for doubtful accounts	19,993	18,940
Unbilled revenue	24,391	19,490
Receivable from U.S. government, less allowance for doubtful accounts	8,467	5,861
Other accounts receivable, less allowance for doubtful accounts	3,151	2,302
Income taxes receivable	17,867	10,793
Materials and supplies	4,294	5,415
Regulatory assets — current	43,296	30,134
Prepayments and other current assets	3,735	3,229
Costs and estimated earnings in excess of billings on contracts	41,245	32,169
Total current assets	166,875	132,697
Regulatory and Other Assets		
Regulatory assets	102,985	102,562
Costs and estimated earnings in excess of billings on contracts	22,687	21,330
Other	5,068	6,750
Total regulatory and other assets	130,740	130,642
Total Assets	\$ 1,470,493	\$ 1,343,959

The accompanying notes are an integral part of these consolidated financial statements.

**AMERICAN STATES WATER COMPANY
CONSOLIDATED BALANCE SHEETS**

(in thousands)	December 31,	
	2016	2015
Capitalization and Liabilities		
Capitalization		
Common shareholders' equity	\$ 494,297	\$ 465,945
Long-term debt	320,981	320,900
Total capitalization	815,278	786,845
Current Liabilities		
Notes payable to banks	90,000	28,000
Long-term debt — current	330	312
Accounts payable	43,724	50,585
Income taxes payable	149	68
Accrued other taxes	9,112	8,142
Accrued employee expenses	12,304	11,748
Accrued interest	3,864	3,626
Unrealized loss on purchased power contracts	4,901	7,053
Billings in excess of costs and estimated earnings on contracts	2,263	3,764
Other	11,297	10,209
Total current liabilities	177,944	123,507
Other Credits		
Advances for construction	69,722	68,041
Contributions in aid of construction — net	120,518	117,810
Deferred income taxes	224,530	192,852
Unamortized investment tax credits	1,529	1,612
Accrued pension and other post-retirement benefits	49,856	42,666
Other	11,116	10,626
Total other credits	477,271	433,607
Commitments and Contingencies (Notes 13 and 14)		
Total Capitalization and Liabilities	\$ 1,470,493	\$ 1,343,959

The accompanying notes are an integral part of these consolidated financial statements.

**AMERICAN STATES WATER COMPANY
CONSOLIDATED STATEMENTS OF CAPITALIZATION**

(in thousands, except share data)	December 31,	
	2016	2015
Common Shareholders' Equity:		
Common Shares, no par value:		
Authorized: 60,000,000 shares		
Outstanding: 36,571,360 shares in 2016 and 36,501,914 shares in 2015	\$ 247,232	\$ 245,022
Reinvested earnings in the business	247,065	220,923
	494,297	465,945
Long-Term Debt (All are of GSWC)		
Notes/Debentures:		
6.81% notes due 2028	15,000	15,000
6.59% notes due 2029	40,000	40,000
7.875% notes due 2030	20,000	20,000
7.23% notes due 2031	50,000	50,000
6.00% notes due 2041	62,000	62,000
Private Placement Notes:		
3.45% notes due 2029	15,000	15,000
9.56% notes due 2031	28,000	28,000
5.87% notes due 2028	40,000	40,000
6.70% notes due 2019	40,000	40,000
Tax-Exempt Obligations:		
5.50% notes due 2026	7,730	7,730
State Water Project due 2035	3,902	4,000
Other Debt Instruments:		
Variable Rate Obligation due 2018	54	89
American Recovery and Reinvestment Act Obligation due 2033	3,896	4,034
	325,582	325,853
Less: Current maturities	(330)	(312)
Debt issuance costs	(4,271)	(4,641)
	320,981	320,900
Total Capitalization	\$ 815,278	\$ 786,845

The accompanying notes are an integral part of these consolidated financial statements.

AMERICAN STATES WATER COMPANY
CONSOLIDATED STATEMENTS OF INCOME

(in thousands, except per share amounts)	For the years ended December 31,		
	2016	2015	2014
Operating Revenues			
Water	\$ 302,931	\$ 328,511	\$ 326,672
Electric	35,771	36,039	34,387
Contracted services	97,385	94,091	104,732
Total operating revenues	436,087	458,641	465,791
Operating Expenses			
Water purchased	64,442	62,726	57,790
Power purchased for pumping	8,663	8,988	10,700
Groundwater production assessment	14,993	13,648	16,450
Power purchased for resale	10,387	10,395	9,649
Supply cost balancing accounts	(12,206)	7,785	6,346
Other operation	28,257	28,429	28,288
Administrative and general	80,994	79,817	78,268
Depreciation and amortization	38,850	42,033	41,073
Maintenance	16,470	16,885	16,092
Property and other taxes	16,801	16,636	16,722
ASUS construction	53,720	52,810	65,368
Total operating expenses	321,371	340,152	346,746
Operating Income	114,716	118,489	119,045
Other Income and Expenses			
Interest expense	(21,992)	(21,088)	(21,617)
Interest income	757	458	927
Other, net	997	356	751
Total other income and expenses	(20,238)	(20,274)	(19,939)
Income from operations before income tax expense	94,478	98,215	99,106
Income tax expense	34,735	37,731	38,048
Net Income	\$ 59,743	\$ 60,484	\$ 61,058
Weighted Average Number of Shares Outstanding	36,552	37,389	38,658
Basic Earnings Per Common Share	\$ 1.63	\$ 1.61	\$ 1.57
Weighted Average Number of Diluted Shares	36,750	37,614	38,880
Fully Diluted Earnings Per Share	\$ 1.62	\$ 1.60	\$ 1.57
Dividends Paid Per Common Share	\$ 0.914	\$ 0.874	\$ 0.831

The accompanying notes are an integral part of these consolidated financial statements.

**AMERICAN STATES WATER COMPANY
CONSOLIDATED STATEMENTS OF CHANGES
IN COMMON SHAREHOLDERS' EQUITY**

(in thousands)	Common Shares		Reinvested	Total
	Number of Shares	Amount	Earnings in the Business	
Balances at December 31, 2013	38,721	\$ 253,961	\$ 238,443	\$ 492,404
Add:				
Net income			61,058	61,058
Exercise of stock options and other issuance of Common Shares	111	589		589
Tax benefit from employee stock-based awards		533		533
Compensation on stock-based awards		1,508		1,508
Dividend equivalent rights on stock-based awards not paid in cash		197		197
Deduct:				
Repurchase of Common Shares	545	3,589	13,591	17,180
Dividends on Common Shares			32,111	32,111
Dividend equivalent rights on stock-based awards not paid in cash			197	197
Balances at December 31, 2014	38,287	253,199	253,602	506,801
Add:				
Net income			60,484	60,484
Exercise of stock options and other issuance of Common Shares	120	1,198		1,198
Tax benefit from employee stock-based awards		877		877
Compensation on stock-based awards		2,168		2,168
Dividend equivalent rights on stock-based awards not paid in cash		270		270
Deduct:				
Repurchase of Common Shares	1,905	12,690	60,203	72,893
Dividends on Common Shares			32,690	32,690
Dividend equivalent rights on stock-based awards not paid in cash			270	270
Balances at December 31, 2015	36,502	245,022	220,923	465,945
Add:				
Net income			59,743	59,743
Exercise of stock options and other issuance of Common Shares	69	235		235
Tax benefit from employee stock-based awards		581		581
Compensation on stock-based awards		1,201		1,201
Dividend equivalent rights on stock-based awards not paid in cash		193		193
Deduct:				
Dividends on Common Shares			33,408	33,408
Dividend equivalent rights on stock-based awards not paid in cash			193	193
Balances at December 31, 2016	36,571	\$ 247,232	\$ 247,065	\$ 494,297

The accompanying notes are an integral part of these consolidated financial statements.

AMERICAN STATES WATER COMPANY
CONSOLIDATED STATEMENTS OF CASH FLOWS

(in thousands)	For the years ended December 31,		
	2016	2015	2014
Cash Flows From Operating Activities:			
Net income	\$ 59,743	\$ 60,484	\$ 61,058
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	39,109	42,674	41,751
Provision for doubtful accounts	619	870	991
Deferred income taxes and investment tax credits	27,640	10,423	32,316
Stock-based compensation expense	2,538	2,754	2,222
Other — net	(397)	838	—
Changes in assets and liabilities:			
Accounts receivable — customers	(1,750)	(923)	3,979
Unbilled revenue	(4,901)	1,932	(2,870)
Other accounts receivable	(1,233)	1,243	1,029
Receivables from the U.S. government	(2,606)	848	397
Materials and supplies	1,121	(1,827)	970
Prepayments and other assets	2,239	1,580	973
Costs and estimated earnings in excess of billings on contracts	(10,433)	(3,223)	6,159
Regulatory assets	(5,610)	(26,422)	26,385
Accounts payable	(3,442)	679	(1,622)
Income taxes receivable/payable	(6,993)	9,630	(11,648)
Billings in excess of costs and estimated earnings on contracts	(1,501)	(7,972)	4,884
Accrued pension and other post-retirement benefits	(289)	616	(2,356)
Other liabilities	3,095	941	(1,348)
Net cash provided	96,949	95,145	163,270
Cash Flows From Investing Activities:			
Capital expenditures	(129,867)	(87,323)	(72,553)
Other investments	(1,354)	(2,869)	(1,568)
Proceeds from sale of property	—	54	62
Net cash used	(131,221)	(90,138)	(74,059)
Cash Flows From Financing Activities:			
Proceeds from stock option exercises	235	1,198	589
Repurchase of Common Shares	—	(72,893)	(17,180)
Tax benefits from stock-based awards	581	877	533
Receipt of advances for and contributions in aid of construction	6,660	3,731	7,598
Refunds on advances for construction	(3,921)	(3,660)	(3,469)
Retirement or repayments of long-term debt	(313)	(237)	(21,287)
Proceeds from issuance of long-term debt, net of issuance costs	—	—	14,846
Net change in notes payable to banks	62,000	28,000	—
Dividends paid	(33,408)	(32,690)	(32,111)
Other	(1,490)	(957)	(968)
Net cash provided (used)	30,344	(76,631)	(51,449)
Net increase (decrease) in cash and cash equivalents	(3,928)	(71,624)	37,762
Cash and cash equivalents, beginning of year	4,364	75,988	38,226
Cash and cash equivalents, end of year	\$ 436	\$ 4,364	\$ 75,988

The accompanying notes are an integral part of these consolidated financial statements.

**GOLDEN STATE WATER COMPANY
BALANCE SHEETS**

(in thousands)	December 31,	
	2016	2015
Assets		
Utility Plant, at cost		
Water	\$ 1,514,419	\$ 1,428,024
Electric	94,009	88,481
Total	1,608,428	1,516,505
Less — accumulated depreciation	(524,927)	(522,749)
	1,083,501	993,756
Construction work in progress	61,810	62,360
Net utility plant	1,145,311	1,056,116
Other Property and Investments	18,719	16,581
	18,719	16,581
Current Assets		
Cash and cash equivalents	209	2,501
Accounts receivable-customers, less allowance for doubtful accounts	19,993	18,940
Unbilled revenue	17,700	18,181
Other accounts receivable, less allowance for doubtful accounts	1,959	1,455
Income taxes receivable from Parent	21,856	11,000
Materials and supplies	3,724	4,860
Regulatory assets — current	43,296	30,134
Prepayments and other current assets	3,520	2,847
Total current assets	112,257	89,918
Regulatory and Other Assets		
Regulatory assets	102,985	102,562
Other	4,906	6,702
Total regulatory and other assets	107,891	109,264
Total Assets	\$ 1,384,178	\$ 1,271,879

The accompanying notes are an integral part of these financial statements.

**GOLDEN STATE WATER COMPANY
BALANCE SHEETS**

(in thousands)	December 31,	
	2016	2015
Capitalization and Liabilities		
Capitalization		
Common shareholder's equity	\$ 446,770	\$ 423,730
Long-term debt	320,981	320,900
Total capitalization	767,751	744,630
Current Liabilities		
Inter-company payable to Parent	61,726	12,000
Long-term debt — current	330	312
Accounts payable	34,648	39,610
Accrued other taxes	8,870	7,830
Accrued employee expenses	10,983	10,630
Accrued interest	3,588	3,599
Unrealized loss on purchased power contracts	4,901	7,053
Other	10,925	9,921
Total current liabilities	135,971	90,955
Other Credits		
Advances for construction	69,722	68,041
Contributions in aid of construction — net	120,518	117,810
Deferred income taxes	227,798	195,658
Unamortized investment tax credits	1,529	1,612
Accrued pension and other post-retirement benefits	49,856	42,666
Other	11,033	10,507
Total other credits	480,456	436,294
Commitments and Contingencies (Notes 13 and 14)		
Total Capitalization and Liabilities		
	\$ 1,384,178	\$ 1,271,879

The accompanying notes are an integral part of these financial statements.

**GOLDEN STATE WATER COMPANY
STATEMENTS OF CAPITALIZATION**

(in thousands, except share data)	December 31,	
	2016	2015
Common Shareholder's Equity:		
Common Shares, no par value:		
Authorized: 1,000 shares		
Outstanding: 146 shares in 2016 and 2015	\$ 240,482	\$ 238,795
Reinvested earnings in the business	206,288	184,935
	<u>446,770</u>	<u>423,730</u>
Long-Term Debt		
Notes/Debentures:		
6.81% notes due 2028	15,000	15,000
6.59% notes due 2029	40,000	40,000
7.875% notes due 2030	20,000	20,000
7.23% notes due 2031	50,000	50,000
6.00% notes due 2041	62,000	62,000
Private Placement Notes:		
3.45% notes due 2029	15,000	15,000
9.56% notes due 2031	28,000	28,000
5.87% notes due 2028	40,000	40,000
6.70% notes due 2019	40,000	40,000
Tax-Exempt Obligations:		
5.50% notes due 2026	7,730	7,730
State Water Project due 2035	3,902	4,000
Other Debt Instruments:		
Variable rate obligation due 2018	54	89
American Recovery and Reinvestment Act Obligation due 2033	3,896	4,034
	<u>325,582</u>	<u>325,853</u>
Less: Current maturities	(330)	(312)
Debt issuance costs	(4,271)	(4,641)
	<u>320,981</u>	<u>320,900</u>
Total Capitalization	<u>\$ 767,751</u>	<u>\$ 744,630</u>

The accompanying notes are an integral part of these financial statements.

**GOLDEN STATE WATER COMPANY
STATEMENTS OF INCOME**

(in thousands)	For the years ended December 31,		
	2016	2015	2014
Operating Revenues			
Water	\$ 302,931	\$ 328,511	\$ 326,672
Electric	35,771	36,039	34,387
Total operating revenues	338,702	364,550	361,059
Operating Expenses			
Water purchased	64,442	62,726	57,790
Power purchased for pumping	8,663	8,988	10,700
Groundwater production assessment	14,993	13,648	16,450
Power purchased for resale	10,387	10,395	9,649
Supply cost balancing accounts	(12,206)	7,785	6,346
Other operation	24,771	24,892	25,548
Administrative and general	64,066	64,877	65,814
Depreciation and amortization	37,804	40,893	39,854
Maintenance	14,519	14,693	13,945
Property and other taxes	15,444	15,244	15,221
Total operating expenses	242,883	264,141	261,317
Operating Income	95,819	100,409	99,742
Other Income and Expenses			
Interest expense	(21,782)	(20,998)	(21,524)
Interest income	749	440	894
Other, net	792	212	751
Total other income and expenses	(20,241)	(20,346)	(19,879)
Income from operations before income tax expense	75,578	80,063	79,863
Income tax expense	28,609	32,472	32,006
Net Income	\$ 46,969	\$ 47,591	\$ 47,857

The accompanying notes are an integral part of these financial statements.

**GOLDEN STATE WATER COMPANY
STATEMENTS OF CHANGES IN
COMMON SHAREHOLDER'S EQUITY**

(in thousands, except number of shares)	Common Shares		Reinvested	Total
	Number of Shares	Amount	Earnings in the Business	
Balances at December 31, 2013	146	\$ 233,721	\$ 203,892	\$ 437,613
Add:				
Net income			47,857	47,857
Tax benefit from employee stock-based awards		514		514
Compensation on stock-based awards		1,206		1,206
Dividend equivalent rights on stock-based awards not paid in cash		166		166
Deduct:				
Dividends on Common Shares			52,000	52,000
Dividend equivalent rights on stock-based awards not paid in cash			166	166
Balances at December 31, 2014	146	235,607	199,583	435,190
Add:				
Net income			47,591	47,591
Tax benefit from employee stock-based awards		872		872
Compensation on stock-based awards		2,077		2,077
Dividend equivalent rights on stock-based awards not paid in cash		239		239
Deduct:				
Dividends on Common Shares			62,000	62,000
Dividend equivalent rights on stock-based awards not paid in cash			239	239
Balances at December 31, 2015	146	238,795	184,935	423,730
Add:				
Net income			46,969	46,969
Tax benefit from employee stock-based awards		501		501
Compensation on stock-based awards		1,020		1,020
Dividend equivalent rights on stock-based awards not paid in cash		166		166
Deduct:				
Dividends on Common Shares			25,450	25,450
Dividend equivalent rights on stock-based awards not paid in cash			166	166
Balances at December 31, 2016	146	\$ 240,482	\$ 206,288	\$ 446,770

The accompanying notes are an integral part of these financial statements.

**GOLDEN STATE WATER COMPANY
STATEMENTS OF CASH FLOWS**

(in thousands)	For the years ended December 31,		
	2016	2015	2014
Cash Flows From Operating Activities:			
Net income	\$ 46,969	\$ 47,591	\$ 47,857
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	38,063	41,534	40,532
Provision for doubtful accounts	627	845	1,054
Deferred income taxes and investment tax credits	28,099	10,719	34,352
Stock-based compensation expense	2,118	2,443	1,748
Other — net	(352)	822	(12)
Changes in assets and liabilities:			
Accounts receivable — customers	(1,750)	(923)	3,979
Unbilled revenue	481	(448)	819
Other accounts receivable	(896)	1,067	670
Materials and supplies	1,136	(2,069)	(932)
Prepayments and other assets	2,114	440	583
Regulatory assets	(5,610)	(26,422)	26,386
Accounts payable	(1,514)	1,940	(1,676)
Inter-company receivable/payable	280	445	219
Income taxes receivable/payable from/to Parent	(10,856)	18,580	(19,876)
Accrued pension and other post-retirement benefits	(289)	616	(2,356)
Other liabilities	2,666	358	(664)
Net cash provided	<u>101,286</u>	<u>97,538</u>	<u>132,683</u>
Cash Flows From Investing Activities:			
Capital expenditures	(127,913)	(86,144)	(70,888)
Note receivable from AWR parent	—	(20,700)	(8,300)
Receipt of payment of note receivable from AWR parent	—	20,700	8,800
Other investing activities	(1,389)	(2,869)	(1,568)
Net cash used	<u>(129,302)</u>	<u>(89,013)</u>	<u>(71,956)</u>
Cash Flows From Financing Activities:			
Proceeds from issuance of long-term debt, net of issuance costs	—	—	14,846
Tax benefits from stock-based awards	501	872	514
Receipt of advances for and contributions in aid of construction	6,660	3,731	7,598
Refunds on advances for construction	(3,921)	(3,660)	(3,469)
Retirement or repayments of long-term debt	(313)	(237)	(21,287)
Net change in inter-company borrowings	49,500	12,000	—
Dividends paid	(25,450)	(62,000)	(52,000)
Other	(1,253)	(735)	(799)
Net cash provided (used)	<u>25,724</u>	<u>(50,029)</u>	<u>(54,597)</u>
Net increase (decrease) in cash and cash equivalents	(2,292)	(41,504)	6,130
Cash and cash equivalents, beginning of year	<u>2,501</u>	<u>44,005</u>	<u>37,875</u>
Cash and cash equivalents, end of year	\$ 209	\$ 2,501	\$ 44,005

The accompanying notes are an integral part of these financial statements.

**AMERICAN STATES WATER COMPANY AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**

Note 1 — Summary of Significant Accounting Policies

Nature of Operations: American States Water Company (“AWR”) is the parent company of Golden State Water Company (“GSWC”) and American States Utility Services, Inc. (“ASUS”) (and its wholly owned subsidiaries, Fort Bliss Water Services Company (“FBWS”), Terrapin Utility Services, Inc. (“TUS”), Old Dominion Utility Services, Inc. (“ODUS”), Palmetto State Utility Services, Inc. (“PSUS”), Old North Utility Services, Inc. (“ONUS”), and Emerald Coast Utility Services, Inc. (“ECUS”). AWR and its subsidiaries may be collectively referred to as “Registrant” or “the Company.” The subsidiaries of ASUS are collectively referred to as the “Military Utility Privatization Subsidiaries.”

GSWC is a public utility engaged principally in the purchase, production, distribution and sale of water in California serving approximately 261,000 customers. GSWC also distributes electricity in several San Bernardino County mountain communities in California serving approximately 24,000 electric customers through its Bear Valley Electric Service (“BVES”) division. Although Registrant has a diversified base of residential, industrial and other customers, revenues derived from commercial and residential water customers accounted for approximately 90% of total water revenues in 2016, 2015 and 2014. The California Public Utilities Commission (“CPUC”) regulates GSWC’s water and electric businesses in matters including properties, rates, services, facilities, and transactions by GSWC with its affiliates.

ASUS, through its wholly owned subsidiaries, operates, maintains and performs construction activities (including renewal and replacement capital work) on water and/or wastewater systems at various United States military bases pursuant to 50-year firm fixed-price contracts. These contracts are subject to periodic price redeterminations or economic price adjustments and modifications for changes in circumstances, changes in laws and regulations and additions to the contract value for new construction of facilities at the military bases.

There is no direct regulatory oversight by the CPUC over AWR or the operations, rates or services provided by ASUS or the Military Utility Privatization Subsidiaries.

Basis of Presentation: The consolidated financial statements and notes thereto are presented in a combined report filed by two separate Registrants: AWR and GSWC. References in this report to “Registrant” are to AWR and GSWC, collectively, unless otherwise specified. Certain prior period amounts have been reclassified to conform to the current period presentation of debt issuance costs.

AWR owns all of the outstanding Common Shares of GSWC and ASUS. ASUS owns all of the outstanding Common shares of the Military Utility Privatization Subsidiaries. The consolidated financial statements of AWR include the accounts of AWR and its subsidiaries, all of which are wholly owned. These financial statements are prepared in conformity with accounting principles generally accepted in the United States of America. Inter-company transactions and balances have been eliminated in the AWR consolidated financial statements.

Related Party Transactions: GSWC and ASUS provide and/or receive various support services to and from their parent, AWR, and among themselves. GSWC also allocates certain corporate office administrative and general costs to its affiliate, ASUS, using allocation factors approved by the CPUC. During the years ended December 31, 2016, 2015 and 2014, GSWC allocated to ASUS approximately \$3.9 million, \$2.6 million and \$2.7 million, respectively, of corporate office administrative and general costs. In addition, AWR has a \$150.0 million syndicated credit facility. AWR borrows under this facility and provides funds to its subsidiaries, including GSWC, in support of their operations. The interest rate charged to GSWC and ASUS is sufficient to cover AWR’s interest cost under the credit facility. Amounts owed to GSWC by AWR, including for allocated expenses, are included in GSWC’s inter-company receivables as of December 31, 2016 and 2015.

In October 2015, AWR issued interest bearing promissory notes (the “Notes”) to GSWC and ASUS for \$40 million and \$10 million, respectively, which expire on May 23, 2018. Under the terms of the Notes, AWR may borrow from GSWC and ASUS amounts up to \$40 million and \$10 million, respectively, for working capital purposes. AWR agrees to pay any unpaid principal amounts outstanding under these notes, plus accrued interest. As of December 31, 2016 and 2015, there were no amounts outstanding under these notes.

Utility Accounting: Registrant’s accounting policies conform to accounting principles generally accepted in the United States of America (“U.S. GAAP”), including the accounting principles for rate-regulated enterprises, which reflect the ratemaking policies of the CPUC and the Federal Energy Regulatory Commission. GSWC has incurred various costs and received various credits reflected as regulatory assets and liabilities. Accounting for such costs and credits as regulatory assets

and liabilities is in accordance with the guidance for accounting for the effects of certain types of regulation. This guidance sets forth the application of U.S. GAAP for those companies whose rates are established by or are subject to approval by an independent third-party regulator.

Under such accounting guidance, rate regulated entities defer costs and credits on the balance sheet as regulatory assets and liabilities when it is probable that those costs and credits will be recognized in the ratemaking process in a period different from the period in which they would have been reflected in income by an unregulated company. These regulatory assets and liabilities are then recognized in the income statement in the period in which the same amounts are reflected in the rates charged for service. The amounts included as regulatory assets and liabilities that will be collected over a period exceeding one year are classified as long-term assets and liabilities as of December 31, 2016 and 2015.

Property and Depreciation: GSWC capitalizes, as utility plant, the cost of construction and the cost of additions, betterments and replacements of retired units of property. Such cost includes labor, material and certain indirect charges. Water systems acquired are recorded at estimated original cost of utility plant when first devoted to utility service and the applicable accumulated depreciation is recorded to accumulated depreciation. The difference between the estimated original cost, less accumulated depreciation, and the purchase price, if recognized by the regulator, is recorded as an acquisition adjustment within utility plant.

Depreciation is computed on the straight-line, remaining-life basis, group method, based on depreciable plant in accordance with the applicable ratemaking process. GSWC's provision for depreciation expressed as a percentage of the aggregate depreciable asset balances was 2.9% for 2016, and 3.2% for 2015 and 2014. Depreciation computed on GSWC's transportation equipment is recorded in other operating expenses and totaled \$259,000, \$641,000 and \$678,000 for the years ended December 31, 2016, 2015 and 2014, respectively. Expenditures for maintenance and repairs are expensed as incurred. Replaced or retired property costs, including cost of removal, are charged to the accumulated provision for depreciation. Property owned and depreciation recorded by ASUS and its subsidiaries are not material to Registrant's financial statements.

Estimated useful lives of GSWC's utility plant, as authorized by the CPUC, are as follows:

Source of water supply	30 years to 50 years
Pumping	25 years to 40 years
Water treatment	20 years to 35 years
Transmission and distribution	25 years to 55 years
Generation	40 years
Other plant	7 years to 40 years

Asset Retirement Obligations: GSWC has a legal obligation for the retirement of its wells, which by law need to be properly capped at the time of removal. As such, GSWC incurs asset retirement obligations. GSWC records the fair value of a liability for these asset retirement obligations in the period in which they are incurred. When the liability is initially recorded, GSWC capitalizes the cost by increasing the carrying amount of the related long-lived asset. Over time, the liability is accreted to its present value each period, and the capitalized cost is depreciated over the useful life of the related asset. Upon settlement of the liability, GSWC either settles the obligation for its recorded amount or incurs a gain or loss upon settlement. Retirement costs have historically been recovered through rates subsequent to the retirement costs being incurred. Accordingly, GSWC's asset retirement obligations are reflected as a regulatory asset. GSWC also reflects the gain or loss at settlement as a regulatory asset or liability on the balance sheet.

With regards to removal costs associated with certain other long-lived assets, such as water mains, distribution and transmission assets, asset retirement obligations have not been recognized as GSWC believes that it will not be obligated to retire these assets. There are no CPUC rules or regulations that require GSWC to remove any of its other long-lived assets. In addition, GSWC's water pipelines are not subject to regulation by any federal regulatory agency. GSWC has franchise agreements with various municipalities in order to use the public right of way for utility purposes (i.e., operate water distribution and transmission assets), and if certain events occur in the future, GSWC could be required to remove or relocate certain of its pipelines. However, it is not possible to estimate an asset retirement amount since the timing and the amount of assets that may be required to be removed, if any, is not known.

Amounts recorded for asset retirement obligations are subject to various assumptions and determinations, such as determining whether a legal obligation exists to remove assets, and estimating the fair value of the costs of removal, when final removal will occur and the credit-adjusted risk-free interest rates to be utilized on discounting future liabilities. Changes that may arise over time with regard to these assumptions will change amounts recorded in the future. Revisions in estimates for

timing or estimated cash flows are recognized as changes in the carrying amount of the liability and the related capitalized asset. The estimated fair value of the costs of removal was based on third party costs.

Impairment of Long-Lived Assets: Long-lived assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be fully recoverable in accordance with accounting guidance for impairment or disposal of long-lived assets. Registrant would recognize an impairment loss on its regulated assets only if the carrying value amount of a long-lived asset is not recoverable from customer rates authorized by the CPUC. Impairment loss is measured as the excess of the carrying value over the amounts recovered in customer rates. For the years ended December 31, 2016, 2015 and 2014, no impairment loss was incurred.

Goodwill: At December 31, 2016 and 2015, AWR had approximately \$1.1 million of goodwill. The \$1.1 million goodwill arose from ASUS's acquisition of a subcontractor's business at some of the Military Utility Privatization Subsidiaries. In accordance with the accounting guidance for testing goodwill, AWR annually assesses qualitative factors to determine whether the existence of events or circumstances leads to a determination that it is more likely than not that the fair value of a reporting unit is less than its carrying amount. For 2016, AWR's assessment of qualitative factors did not indicate that an impairment had occurred for the goodwill amount of \$1.1 million at ASUS.

Cash and Cash Equivalents: Cash and cash equivalents include short-term cash investments with an original maturity of three months or less. At times, cash and cash equivalent balances may be in excess of federally insured limits. Cash and cash equivalents are held with financial institutions with high credit standings.

Accounts Receivable: Accounts receivable is reported on the balance sheet net of any allowance for doubtful accounts. The allowance for doubtful accounts is Registrant's best estimate of the amount of probable credit losses in Registrant's existing accounts receivable from its water and electric customers, and is determined based on historical write-off experience and the aging of account balances. Registrant reviews the allowance for doubtful accounts quarterly. Account balances are written off against the allowance when it is probable the receivable will not be recovered. When utility customers request extended payment terms, credit is extended based on regulatory guidelines, and collateral is not required. Receivables from the U.S. Government include amounts due under contracts with the U.S. Government to operate and maintain, and/or provide construction services for the water and/or wastewater systems at military bases. Other accounts receivable consist of amounts due from third parties (non-utility customers) for various reasons, including amounts due from contractors, amounts due under settlement agreements, and amounts due from other third-party prime government contractors pursuant to agreements for construction of water and/or wastewater facilities for such third-party prime contractors. The allowance for these other accounts receivable is based on Registrant's evaluation of the receivable portfolio under current conditions and a review of specific problems and such other factors that, in Registrant's judgment, should be considered in estimating losses. Allowances for doubtful accounts are disclosed in Note 16.

Materials and Supplies: Materials and supplies are stated at the lower of cost or market. Cost is computed using average cost. Major classes of materials include pipe, hydrants and valves.

Interest: Interest incurred during the construction of capital assets has generally not been capitalized for financial reporting purposes as such policy is not followed in the ratemaking process. Interest expense is generally recovered through the regulatory process. However, the CPUC has authorized certain capital projects to be filed for revenue recovery with advice letters when those projects are completed. During the time that such projects are under development and construction, GSWC may accrue an allowance for funds used during construction ("AFUDC") on the incurred expenditures to offset the cost of financing project construction. For the years ended December 31, 2016, 2015 and 2014, GSWC recorded \$101,000, \$694,000 and \$24,000, respectively, of AFUDC related to these capital projects based on a weighted cost of capital of 8.34% for water and a cost of debt of 6.96% for electric, as approved by the CPUC.

Water and Electric Operating Revenues: GSWC records water and electric utility operating revenues when the service is provided to customers. Revenues include amounts billed to customers on a cycle basis based on meter readings for services provided and unbilled revenues representing estimated amounts to be billed for usage from the last meter reading date to the end of the accounting period. Unbilled revenues are based on historic customer usage to estimate unbilled usage. Flat-rate customers are billed in advance at the beginning of the service period. Revenue from flat-rate customers is deferred and adjustments are calculated to determine the revenue related to the applicable period.

Alternative-Revenue Programs: As authorized by the CPUC, GSWC records in revenues the difference between the adopted level of volumetric revenues as authorized by the CPUC for metered accounts (volumetric revenues) and the actual volumetric revenues recovered in customer rates. If this difference results in an under-collection of revenues, GSWC records the additional revenue only to the extent that they are expected to be collected within 24 months following the year in which they are recorded in accordance with the accounting guidance for alternative-revenue programs.

Contracted Services Revenues: Revenues from ASUS contract operations and maintenance agreements are recognized on a monthly basis when services have been rendered to the U.S. government. Revenues for construction contracts are recognized based on the percentage-of-completion and cost-plus methods of accounting. In accordance with U.S. GAAP, revenue recognition under these methods require ASUS to estimate the progress toward completion on a contract in terms of efforts (such as costs incurred) or, in the case of the percentage of completion method, in terms of results achieved (such as units constructed). These approaches are used because management considers them to be the best available measure of progress on these contracts. Revenues from cost-plus contracts of ASUS are recognized on the basis of costs incurred during the period plus the profit earned, measured by the cost-to-cost method. Unbilled receivables from the U.S. government represent amounts to be billed for construction work completed and/or for services rendered pursuant to contracts with the U.S government, which are not presently billable but which will be billed under the terms of those contracts.

Construction costs for ASUS include all direct material and labor costs charged by subcontractors, direct labor of employees of the Military Utility Privatization Subsidiaries, and those indirect costs related to contract performance, such as indirect labor, supplies, and tools. The factors considered in including such costs in revenues and expenses are that ASUS and/or its subsidiaries: (i) are the primary obligor in these arrangements with the U.S. government and the third party prime contractors, (ii) have latitude in establishing pricing, and (iii) bear credit risk in the collection of receivables. Administrative and general costs are charged to expense as incurred. Precontract costs for ASUS, which consist of design and engineering labor costs, are deferred if they are probable of recovery and are expensed as incurred if they are not probable of recovery. Deferred precontract costs have been immaterial to date. Provisions for estimated losses on uncompleted contracts are made in the period in which such losses are determined.

Changes in job performance, job conditions, change orders and estimated profitability, including those arising from contract penalty provisions, and final contract settlements may result in revisions to costs and income for ASUS and are recognized in the period in which the revisions are determined.

The asset, “Costs and estimated earnings in excess of billings on contracts,” represents revenues recognized in excess of amounts billed. The liability, “Billings in excess of costs and estimated earnings on contracts,” represents billings in excess of revenues recognized. Amounts expected to be earned/collected in the next 12-months have been classified as current.

Debt Issuance Costs and Redemption Premiums: Original debt issuance costs are deducted from the carrying value of the associated debt liability and amortized over the lives of the respective issues. Premiums paid on the early redemption of debt, which is reacquired through refunding, are deferred and amortized over the life of the debt issued to finance the refunding as Registrant normally receives recovery of these costs in rates.

Advances for Construction and Contributions in Aid of Construction: Advances for construction represent amounts advanced by developers for the cost to construct water system facilities in order to extend water service to their properties. Advances are generally refundable in equal annual installments, generally over 40 years. In certain instances, GSWC makes refunds on these advances over a specific period of time based on operating revenues related to the main or as new customers are connected to receive service from the main. Utility plant funded by advances and contributions is excluded from rate base. Generally, GSWC depreciates contributed property and amortizes contributions in aid of construction at the composite rate of the related property. Contributions in aid of construction are similar to advances, but require no refunding.

Fair Value of Financial Instruments: For cash and cash equivalents, accounts receivable, accounts payable and short-term debt, the carrying amount is assumed to approximate fair value due to the short-term nature of the amounts. The table below estimates the fair value of long-term debt issued by GSWC. Rates available to GSWC at December 31, 2016 and 2015 for debt with similar terms and remaining maturities were used to estimate fair value for long-term debt. Changes in the assumptions will produce differing results.

(dollars in thousands)	2016		2015	
	Carrying Amount	Fair Value	Carrying Amount	Fair Value
Long-term debt—GSWC (1)	\$ 325,582	\$ 423,124	\$ 325,853	\$ 403,844

(1) Excludes debt issuance costs and redemption premiums.

The accounting guidance for fair value measurements applies to all financial assets and financial liabilities that are being measured and reported on a fair value basis. Under the accounting guidance, GSWC makes fair value measurements that are classified and disclosed in one of the following three categories:

Level 1: Unadjusted quoted prices in active markets that are accessible at the measurement date for identical, unrestricted assets or liabilities;

Level 2: Quoted prices in markets that are not active, or inputs which are observable, either directly or indirectly, for substantially the full term of the asset or liability; or

Level 3: Prices or valuation techniques that require inputs that are both significant to the fair value measurement and unobservable (i.e., supported by little or no market activity).

Publicly issued notes, private placement notes and other long-term debt are measured using current U.S. corporate bond yields for similar debt instruments and are classified as Level 2. The following table sets forth by level, within the fair value hierarchy, GSWC's long-term debt measured at fair value as of December 31, 2016:

(dollars in thousands)	Level 1	Level 2	Level 3	Total
Long-term debt—GSWC	—	\$ 423,124	—	\$ 423,124

Stock Awards: AWR has issued stock awards to its employees under the 2000 Stock Incentive Plan, ("2000 employee plan"), the 2008 Stock Incentive Plan, ("2008 employee plan"), and the 2016 Stock Incentive Plan, ("2016 employee plan"). AWR has also issued stock awards to its directors under the 2003 Non-Employee Directors Stock Plan, ("2003 directors plan"), and the 2013 Non-Employee Directors Plan, ("2013 directors plan"). Registrant applies the provisions in the accounting guidance for share-based payments in accounting for all of its stock-based awards. See Note 12 for further discussion.

Sales and Use Taxes: GSWC bills certain sales and use taxes levied by state or local governments to its customers. Included in these sales and use taxes are franchise fees, which GSWC pays to various municipalities (based on ordinances adopted by these municipalities) in order to use public rights of way for utility purposes. GSWC bills these franchise fees to its customers based on a CPUC-authorized rate for each rate-making area as applicable. These franchise fees, which are required to be paid regardless of GSWC's ability to collect them from its customers, are accounted for on a gross basis. GSWC's franchise fees billed to customers and recorded as operating revenue were approximately \$3.5 million, \$3.8 million and \$3.7 million for the years ended December 31, 2016, 2015 and 2014, respectively. When GSWC acts as an agent, and the tax is not required to be remitted if it is not collected from the customer, the taxes are accounted for on a net basis.

Depending on the state in which its subsidiary operations are conducted, ASUS is also subject to certain state non-income tax assessments generally computed on a "gross receipts" or "gross revenues" basis. These non-income tax assessments are required to be paid regardless of whether the subsidiary is reimbursed by the U.S. government for these assessments under its 50-year contracts, including modifications to these contracts. The non-income tax assessments are accounted for on a gross basis and totaled \$309,000, \$367,000 and \$490,000 during the years ended December 31, 2016, 2015 and 2014, respectively.

Recently Issued Accounting Pronouncements:

In April 2015, the Financial Accounting Standards Board ("FASB") issued Accounting Standard Update 2015-03, *Simplifying the Presentation of Debt Issuance Costs*, which requires debt issuance costs to be presented in the balance sheet as a direct deduction from the carrying value of the associated debt liability, rather than as an asset. The standard does not affect the recognition and measurement of debt issuance costs. Registrant adopted the guidance effective January 1, 2016. As of December 31, 2016 and 2015, Registrant had \$4.3 million in debt issuance costs reflected under "Long-term debt."

In March 2016, the FASB issued Accounting Standard Update 2016-09, *Improvements to Employee Share-Based Payment Accounting*, which amends ASC Topic 718, *Compensation - Stock Compensation*. Under the new guidance, the tax effects related to share-based payments at settlement (or expiration) will be required to be recorded through the income statement rather than through equity, further increasing the volatility of income tax expense. The new standard also removes the requirement to delay recognition of a windfall tax benefit until an employer reduces its current taxes payable. It also permits entities to make an accounting policy election for the impact of forfeitures on the recognition of expense for share-based payment awards. The standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2016. Once adopted, income tax benefits in excess of compensation costs or tax deficiencies for share-based compensation will be recorded to the income tax provision, instead of to Registrant's shareholders' equity, which will impact the effective tax rate. Registrant will adopt the new standard during the first quarter of 2017, effective January 1, 2017, and it does not expect the new guidance to have a significant impact on Registrant's net earnings or effective tax rate.

In May 2014, the FASB issued updated accounting guidance on revenue recognition. Under this guidance, an entity will recognize revenue when it transfers promised goods or services to customers in an amount that reflects what the entity expects in exchange for the goods or services. The guidance also requires more detailed disclosures to enable users of financial statements to understand the nature, amount, timing and uncertainty of revenue and cash flows arising from contracts with customers. The guidance is effective for fiscal years, and interim periods within those years, beginning after December 15, 2017, and adoption is not permitted earlier than 2017. The guidance allows entities to select one of two methods of adoption, either the full retrospective approach, meaning the guidance would be applied to all periods presented, or modified retrospective approach, meaning the cumulative effect of applying the guidance would be recognized as an adjustment to opening retained earnings at January 1, 2018, along with providing certain additional disclosures. Registrant will adopt this guidance in the fiscal year beginning January 1, 2018 and expects to adopt this guidance under the modified retrospective approach. Management continues to assess all potential impacts of the standard, and does not believe the new standard will have an impact on GSWC's revenues for water and electric customer usage and meter charges. At this time, it is not clear how the new standard applies to contributions in aid of construction-type contracts which, under current U.S. GAAP, are recorded as liabilities and a reduction to rate base. In instances where construction contracts contain more than one distinct good or service, as defined by the standard, the new standard may affect the timing of when Registrant recognizes contracted services revenue for such contracts.

In February 2016, the FASB issued a new lease accounting standard, *Leases* (ASC 842). Under the new guidance, lessees will be required to recognize a right-of-use asset and a lease liability for virtually all of their leases (other than leases that meet the definition of a short-term lease). For income statement purposes, leases will be classified as either operating or finance. Operating leases will result in straight-line expense while finance leases will result in a front-loaded expense pattern. The standard is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2018. Management has not yet determined the effect of the standard on the Company's ongoing financial reporting.

In August 2016, the FASB issued updated accounting guidance on the classification of certain cash receipts and cash payments in the statement of cash flows, which is intended to reduce diversity in practice in how certain transactions are classified in the statement of cash flows. This guidance is effective for fiscal years, and interim periods within those years, beginning after December 15, 2017, and early adoption is permitted. Registrant is currently evaluating the impact of this new standard on its consolidated cash flow statement.

Note 2 — Regulatory Matters

In accordance with accounting principles for rate-regulated enterprises, Registrant records regulatory assets, which represent probable future recovery of costs from customers through the ratemaking process, and regulatory liabilities, which represent probable future refunds that are to be credited to customers through the ratemaking process. At December 31, 2016, Registrant had approximately \$56.9 million of regulatory assets, net of regulatory liabilities, not accruing carrying costs. Of this amount, \$26.8 million relates to the underfunded position in Registrant's pension and other post-retirement obligations, \$4.9 million relates to a memorandum account authorized by the CPUC to track unrealized gains and losses on BVES's purchase power contracts over the term of the contracts, and \$20.1 million relates to deferred income taxes representing accelerated tax benefits flowed through to customers, which will be included in rates concurrently with recognition of the associated future tax expense. The remainder relates to other items that do not provide for or incur carrying costs.

Regulatory assets represent costs incurred by GSWC for which it has received or expects to receive rate recovery in the future. In determining the probability of costs being recognized in other periods, GSWC considers regulatory rules and decisions, past practices, and other facts or circumstances that would indicate if recovery is probable. If the CPUC determines that a portion of GSWC's assets are not recoverable in customer rates, GSWC must determine if it has suffered an asset impairment that requires it to write down the asset's value. Regulatory assets are offset against regulatory liabilities within each rate-making area. Amounts expected to be collected or refunded in the next twelve months have been classified as current assets and current liabilities by rate-making area. Regulatory assets, less regulatory liabilities, included in the consolidated balance sheets are as follows:

(dollars in thousands)	December 31,	
	2016	2015
GSWC		
Water Revenue Adjustment Mechanism and Modified Cost Balancing Account	\$ 47,340	\$ 45,171
Costs deferred for future recovery on Aerojet case	11,820	12,699
Pensions and other post-retirement obligations (Note 11)	28,118	21,996
Derivative unrealized loss (Note 4)	4,901	7,053
Flow-through taxes, net (Note 10)	20,134	16,176
Low income rate assistance balancing accounts	8,272	8,699
General rate case memorandum accounts	13,929	4,433
Other regulatory assets	17,633	21,235
Various refunds to customers	(5,866)	(4,766)
Total	<u>\$ 146,281</u>	<u>\$ 132,696</u>

Water General Rate Case

On December 15, 2016, the CPUC issued a final decision on GSWC's water general rate case. GSWC filed a general rate case application in July 2014 for all of its water ratemaking areas and the general office to determine new rates for the years 2016 - 2018. The new rates approved by the CPUC were retroactive to January 1, 2016. The 2016 adopted revenues were lower than in 2015 due primarily to reductions in (i) supply costs caused by lower consumption, (ii) depreciation expense resulting from an updated depreciation study, and (iii) other operating expenses. In addition, in accordance with a settlement between GSWC and the CPUC's Office of Ratepayer Advocates, the decision used updated inflation index values to calculate operating expense increases for 2015 and 2016. These recent inflation indices were much lower than the inflation indices used in July 2014 when the water rate case application was filed.

The decision also approved updated consumption levels used to calculate rates for 2016 - 2018, which reflect state-mandated conservation targets that were previously in place. While the 2016 adopted revenue requirement is lower than 2015, customer rates for 2016 were higher on a total company basis than in 2015 due to lower consumption levels. As a result, as of December 31, 2016, GSWC added \$9.5 million to the general rate case memorandum accounts regulatory asset representing the rate difference between interim rates and final rates authorized by the CPUC, retroactive to January 1, 2016. Surcharges will be implemented to recover the retroactive rate difference over approximately 12 - 24-months. The decision also temporarily removed the cap for the current rate cycle on total Water Revenue Adjustment Mechanism/Modified Cost Balancing Account surcharges in any given calendar year of 10% of the last authorized revenue requirement. Finally, the decision approved recovery of previously incurred costs that were being tracked in CPUC-authorized memorandum accounts, which resulted in the recording of approximately \$800,000 in other regulatory assets with a corresponding reduction to administrative and general expenses for 2016.

Alternative-Revenue Programs:

Under the Water Revenue Adjustment Mechanism ("WRAM"), GSWC records the difference between the adopted level of volumetric revenues as authorized by the CPUC for metered accounts (adopted volumetric revenues) and the actual volumetric revenues recovered in customer rates. While the WRAM tracks volumetric-based revenues, the revenue requirements approved by the CPUC include service charges, flat rate charges, and other items that are not subject to the WRAM. The adopted volumetric revenues consider the seasonality of consumption of water based upon historical averages. The variance between adopted volumetric revenues and actual billed volumetric revenues for metered accounts is recorded as a component of revenue with an offsetting entry to an asset or liability balancing account (tracked individually for each rate making area). The variance amount may be positive or negative and represents amounts that will be billed or refunded to customers in the future. The WRAM only applies to customer classes with conservation rates in place. The majority of GSWC's water customers have conservation rate structures.

Under the Modified Cost Balancing Account ("MCBA"), GSWC tracks adopted expense levels for purchased water, purchased power and pump taxes, as established by the CPUC. Variances (which include the effects of changes in both rate and volume) between adopted and actual purchased water, purchased power, and pump tax expenses are recorded as a component of the MCBA to be recovered from or refunded to GSWC's customers at a later date. This is reflected with an offsetting entry to an asset or liability balancing account (tracked individually for each rate-making area). Unlike the WRAM, the MCBA applies to all customer classes.

The recovery or refund of the WRAM is netted against the MCBA over- or under-collection for the corresponding rate-making area and bears interest at the current 90-day commercial-paper rate. During the year ended December 31, 2016, surcharges of \$18.4 million were billed to customers to recover the WRAM/MCBA balances as of December 31, 2015. During 2016, GSWC recorded an additional \$19.7 million under-collection in the WRAM account, net of the MCBA. The majority of this balance represents an under-collection of supply costs incurred and recorded in the MCBA due to a higher volume of purchased water as compared to adopted. As of December 31, 2016, GSWC had an aggregated regulatory asset of \$47.3 million, which is comprised of a \$34.7 million under-collection in the WRAM accounts and a \$12.6 million under-collection in the MCBA accounts. In March 2017, GSWC is expected to file with the CPUC for recovery of the 2016 WRAM/MCBA balances.

As required by the accounting guidance for alternative revenue programs, GSWC is required to collect its WRAM balances within 24 months following the year in which an under-collection is recorded. The CPUC has set the recovery period for under-collected WRAM balances that are up to 15% of adopted annual revenues at 18 months or less. For under-collected balances greater than 15%, the recovery period is 19 to 36 months. The recovery periods for the majority of GSWC's WRAM/MCBA balances are primarily within the 12 to 24 month period; however, there were some ratemaking areas that had recovery periods greater than 24 months. Based on the current CPUC-stipulated recovery periods, as of December 31, 2015, GSWC had estimated that approximately \$1.4 million of its 2015 WRAM under-collection would not be collected within 24 months as required for revenue recognition under the accounting guidance for alternative revenue programs. As a result, during the fourth quarter of 2015, GSWC did not record \$1.4 million of the 2015 WRAM under-collection balance as revenue. This amount is being recognized as revenue when it is determined that it will be collected within 24 months. Approximately \$910,000 of the 2015 WRAM was recognized in 2016 with the remaining \$510,000 to be recognized in future periods.

Costs Deferred for Future Recovery:

The CPUC authorized a memorandum account to allow for the recovery of costs incurred by GSWC related to contamination lawsuits brought against Aerojet-General Corporation ("Aerojet") and the state of California. In July 2005, the CPUC authorized GSWC to recover approximately \$21.3 million of the Aerojet litigation memorandum account, through a rate surcharge, which will continue for no longer than 20 years. Beginning in October 2005, a surcharge went into effect to begin amortizing the memorandum account over a 20-year period.

Aerojet also agreed to reimburse GSWC \$17.5 million, plus interest accruing from January 1, 2004, for GSWC's past legal and expert costs, which is included in the Aerojet litigation memorandum account. The reimbursement of the \$17.5 million is contingent upon the issuance of land use approvals for development in a defined area within Aerojet property in Eastern Sacramento County and the receipt of certain fees in connection with such development. It is management's intention to offset any proceeds from the housing development by Aerojet in this area against the balance in this litigation memorandum account.

At this time, management believes the full balance of the Aerojet litigation memorandum account will be collected either from customers or Aerojet.

Pensions and Other Postretirement Obligations:

A regulatory asset has been recorded at December 31, 2016 and 2015 for the costs that would otherwise be charged to “other comprehensive income” within shareholders’ equity for the underfunded status of Registrant’s pension and other postretirement benefit plans because the cost of these plans has historically been recovered through rates. As discussed in Note 11, as of December 31, 2016, Registrant’s underfunded position for these plans that have been recorded as a regulatory asset totaled \$26.8 million. Registrant expects this regulatory asset to be recovered through rates in future periods.

Previous CPUC decisions in the water and electric general rate cases have authorized GSWC to continue using a two-way balancing account to track differences between the forecasted annual pension expenses adopted in rates and the actual annual expense to be recorded by GSWC in accordance with the accounting guidance for pension costs. The two-way balancing accounts bear interest at the current 90-day commercial paper rate. As of December 31, 2016, GSWC has a net \$1.3 million under-collection in the two-way pension balancing accounts, consisting of a \$1.9 million under-collection related to the general office and water regions, and a \$617,000 over-collection related to BVES.

Low Income Balancing Accounts:

This regulatory asset reflects primarily the costs of implementing and administering the California Alternate Rates for Water program in GSWC’s water regions and the California Alternate Rate for Energy program in GSWC’s BVES division. These programs mandated by the CPUC provide a discount of a fixed dollar amount which is intended to represent a 15% discount based on a typical customer bill for qualified low-income water customers and 20% for qualified low-income electric customers. GSWC accrues interest on its low income balancing accounts at the prevailing rate for 90-day commercial paper. As of December 31, 2016, there is an aggregate \$8.3 million under-collection in the low income balancing accounts. Surcharges have been implemented to recover the costs included in these balancing accounts.

General Rate Case Memorandum Accounts:

The balance in the general rate case memorandum accounts represents the revenue differences between interim rates and final rates authorized by the CPUC due to delays in receiving decisions on various general rate case applications. As of December 31, 2016, there is a net aggregate \$13.9 million under-collection in these accounts, including the \$9.5 million revenue difference between interim rates and final rates authorized by the CPUC in the December 2016 decision. The remainder of the balance relates to rate differences resulting from prior GRC delays. As part of the CPUC’s December 2016 decision, GSWC has been authorized to implement 12 -24 month surcharges to collect the \$13.9 million balance.

Other Regulatory Assets:

Other regulatory assets represent costs incurred by GSWC for which it has received or expects to receive rate recovery in the future. These regulatory assets are supported by regulatory rules and decisions, past practices, and other facts or circumstances that indicate recovery is probable.

Other Regulatory Matters:

Procurement Audits:

In December 2011, the CPUC issued a final decision adopting a settlement between GSWC and the CPUC on its investigation of certain work orders and charges paid to a specific contractor. As part of the settlement reached with the CPUC on this matter, GSWC agreed to be subject to three separate independent audits of its procurement practices over a period of 10 years from the date the settlement was approved by the CPUC. The audits cover GSWC’s procurement practices for contracts with other contractors from 1994 forward. The first audit started in 2014 and covered the period from January 1, 1994 through September 30, 2013.

In March 2015, the accounting firm engaged by the CPUC to conduct the first independent audit issued its final report to the CPUC’s Division of Water and Audits (“DWA”). The final report, which was issued on a confidential basis, included GSWC’s responses to the accounting firm’s findings, as well as the firm’s responses to GSWC’s comments. DWA informed GSWC that it does not intend to pursue further investigation, refunds, or penalties in respect of past procurement activities as a result of the final report. In its decision issued in December 2016 on GSWC’s water GRC, the CPUC did not propose any further action related to the first independent audit report.

Renewables Portfolio Standard:

BVES is subject to the renewables portfolio standard (“RPS”) law, which requires meeting certain targets of purchases of energy from renewable energy resources. In December 2012, GSWC entered into a ten-year agreement with a third party to purchase renewable energy credits (“RECs”) whereby GSWC agreed to purchase approximately 582,000 RECs over a 10 -year

period, which would be used towards meeting the CPUC’s RPS procurement requirements. As of December 31, 2016, GSWC believes it has purchased sufficient RECs to be in compliance for all periods through 2016. Accordingly, no provision for loss or potential penalties has been recorded in the financial statements as of December 31, 2016. GSWC intends to file its 2016 compliance report with the CPUC by the August 2017 deadline. The cost of these RECs has been included as part of the electric supply cost balancing account as of December 31, 2016.

In October 2015, the governor of California signed a bill into law requiring, among other things, electric utilities to generate half of their electricity from renewable energy sources by 2030. The new requirement is in addition to the existing requirement for electric utilities to generate one third of their electricity from renewable sources by 2020. BVES is currently assessing various renewable energy opportunities to be in compliance with these requirements.

Formal Complaint Filed at the CPUC:

In June 2016, a third party filed a formal complaint with the CPUC against GSWC in connection with a water main break that occurred in 2014. The water main break caused damage to a commercial building. Repairs to the building have been delayed for a variety of reasons, including a dispute and litigation between two of GSWC’s insurance carriers regarding their respective coverage obligations, as well as questions as to the nature and extent of the building’s damage and the costs associated therewith. The complaint filed with the CPUC requests, among other things, that the CPUC investigate the main break, the damage to the commercial building, and the delay of its repairs, and the complaint asks the CPUC to order GSWC to immediately complete repairs. GSWC believes it has reasonable defenses to the complaint filed with the CPUC. In July 2016, GSWC filed an answer to the formal complaint with the CPUC as well as a motion to dismiss the complaint. Previously, the owners of the commercial building filed suit in Ventura County Superior Court against GSWC for damages to the building. The trial of this lawsuit is expected to begin during the first half of 2017. At this time, GSWC believes it has sufficient insurance coverage to cover any judgment entered in the civil suit pending in Superior Court. However, GSWC cannot predict the outcome of the Superior Court litigation, the dispute and litigation between its insurers, or the CPUC proceeding.

Note 3 — Utility Plant and Intangible Assets

The following table shows Registrant’s utility plant by major asset class:

(dollars in thousands)	AWR December 31,		GSWC December 31,	
	2016	2015	2016	2015
Water				
Land	\$ 15,393	\$ 15,299	\$ 15,393	\$ 15,299
Intangible assets	36,291	34,848	36,273	34,830
Source of water supply	86,775	86,914	86,775	86,914
Pumping	169,983	161,668	169,983	161,668
Water treatment	74,980	72,238	74,980	72,238
Transmission and distribution	1,014,925	941,651	1,014,925	941,651
General	127,969	126,438	116,090	115,424
	<u>1,526,316</u>	<u>1,439,056</u>	<u>1,514,419</u>	<u>1,428,024</u>
Electric				
Transmission and distribution	71,112	66,121	71,112	66,121
Generation	12,583	12,563	12,583	12,563
General (1)	10,314	9,797	10,314	9,797
	<u>94,009</u>	<u>88,481</u>	<u>94,009</u>	<u>88,481</u>
Less — accumulated depreciation	(532,753)	(529,698)	(524,927)	(522,749)
Construction work in progress	63,354	62,955	61,810	62,360
Net utility plant	<u>\$ 1,150,926</u>	<u>\$ 1,060,794</u>	<u>\$ 1,145,311</u>	<u>\$ 1,056,116</u>

(1) Includes intangible assets of \$1.2 million for the years ended December 31, 2016 and 2015 for studies performed in association with the electricity segment of the Registrant’s operations.

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As of December 31, 2016 and 2015, intangible assets consist of the following:

(dollars in thousands)	Weighted Average Amortization Period	AWR December 31,		GSWC December 31,	
		2016	2015	2016	2015
Intangible assets:					
Conservation programs	3 years	\$ 9,496	\$ 9,496	\$ 9,496	\$ 9,496
Water and service rights (2)	30 years	8,695	8,695	8,124	8,124
Water planning studies	14 years	19,487	18,044	19,487	18,044
Total intangible assets		37,678	36,235	37,107	35,664
Less — accumulated amortization		(28,108)	(26,291)	(28,001)	(26,196)
Intangible assets, net of amortization		\$ 9,570	\$ 9,944	\$ 9,106	\$ 9,468
Intangible assets not subject to amortization (3)		\$ 427	\$ 427	\$ 409	\$ 409

(2) Includes intangible assets of \$571,000 for contracted services included in "Other Property and Investments" on the consolidated balance sheets as of December 31, 2016 and 2015.

(3) The intangible assets not subject to amortization primarily consist of organization and consent fees.

For the years ended December 31, 2016, 2015 and 2014, amortization of intangible assets was \$1.9 million, \$1.8 million and \$1.9 million, respectively, for AWR and GSWC. Estimated future consolidated amortization expenses related to intangible assets for the succeeding five years are (in thousands):

	Amortization Expense
2017	\$ 1,922
2018	1,922
2019	1,737
2020	1,609
2021	1,485
Total	\$ 8,675

There is no material difference between the consolidated operations of AWR and the operations of GSWC in regards to the future amortization expense of intangible assets.

Asset Retirement Obligations:

The following is a reconciliation of the beginning and ending aggregate carrying amount of asset retirement obligations, which are included in "Other Credits" on the balance sheets as of December 31, 2016 and 2015:

(dollars in thousands)	GSWC
Obligation at December 31, 2014	\$ 3,234
Additional liabilities incurred	7
Accretion	209
Revision of previous estimates	707
Obligation at December 31, 2015	\$ 4,157
Additional liabilities incurred	121
Liabilities settled	(112)
Accretion	227
Obligation at December 31, 2016	\$ 4,393

Registrant follows the accounting guidance for asset retirement obligations. Because retirement costs have historically been recovered through rates at the time of retirement, upon implementing this guidance, the cumulative effect of the adoption of the authoritative guidance was reflected as a regulatory asset.

Note 4 — Derivative Instruments

BVES purchases power under long-term contracts at a fixed cost depending on the amount of power and the period during which the power is purchased under such contracts. In December 2014, the CPUC approved an application that allowed BVES to immediately execute new long-term purchased power contracts with energy providers on December 9, 2014. BVES began taking power under these long-term contracts effective January 1, 2015 at a fixed cost over three and five year terms depending on the amount of power and period during which the power is purchased under the contracts.

The long-term contracts executed in December 2014 are subject to the accounting guidance for derivatives and require mark-to-market derivative accounting. Among other things, the CPUC also authorized GSWC to establish a regulatory asset and liability memorandum account to offset the mark-to-market entries required by the accounting guidance. Accordingly, all unrealized gains and losses generated from the purchased power contracts executed in December 2014 are deferred on a monthly basis into a non-interest bearing regulatory memorandum account that tracks the changes in fair value of the derivative throughout the term of the contract. As a result, these unrealized gains and losses do not impact GSWC's earnings. As of December 31, 2016, there was a \$4.9 million unrealized loss in the memorandum account, with a corresponding unrealized loss liability for the purchased power contracts as a result of a drop in energy prices. The notional volume of derivatives remaining under these long-term contracts as of December 31, 2016 was approximately 352,000 megawatt hours.

As previously discussed in Note 1, the accounting guidance for fair value measurements establishes a framework for measuring fair value and requires fair value measurements to be classified and disclosed in one of three levels. Registrant's valuation model utilizes various inputs that include quoted market prices for energy over the duration of the contract. The market prices used to determine the fair value for this derivative instrument were estimated based on independent sources such as broker quotes and publications that are not observable in or corroborated by the market. Registrant received one broker quote to determine the fair value of its derivative instrument. When such inputs have a significant impact on the measurement of fair value, the instrument is categorized in Level 3. Accordingly, the valuation of the derivative on Registrant's purchased power contract has been classified as Level 3 for all periods presented.

The following table presents changes in the fair value of GSWC's derivatives for the years ended December 31, 2016 and 2015:

(dollars in thousands)	2016	2015
Balance, at beginning of the period	\$ (7,053)	\$ (3,339)
Unrealized gain (loss) on purchased power contracts	2,152	(3,714)
Balance, at end of the period	<u>\$ (4,901)</u>	<u>\$ (7,053)</u>

Note 5 — Military Privatization

Each of the Military Utility Privatization Subsidiaries have entered into a service contract with the U.S. government to operate and maintain, as well as perform construction activities to renew and replace, the water and/or wastewater systems at a military base or bases. The amounts charged for these services are based upon the terms of the 50-year contract between ASUS or the Military Utility Privatization Subsidiaries and the U.S. government. Under the terms of each of these agreements, the Military Utility Privatization Subsidiaries agree to operate and maintain the water and/or wastewater systems for: (i) a monthly net fixed-price for operation and maintenance, and (ii) an amount to cover renewals and replacement capital work. In addition, these contracts may also include firm, fixed-priced initial capital upgrade projects to upgrade the existing infrastructure. Contract modifications are also issued for other necessary capital upgrades to the existing infrastructure approved by the U.S. government.

Under the terms of each of these contracts, prices are to be redetermined every three years, following the first two years of the contract, or are subject to an economic price adjustment ("EPA") provision, on an annual basis. Prices may also be equitably adjusted for changes in law and other circumstances. ASUS is permitted to file, and has filed, requests for equitable adjustment ("REA"). Each of the contracts may be subject to termination, in whole or in part, prior to the end of the 50-year term for convenience of the U.S. government or as a result of default or nonperformance by the Military Utility Privatization Subsidiaries.

In July 2016, ASUS was awarded a 50-year contract by the U.S. government to operate, maintain, and provide construction management services for the water and wastewater systems at Eglin Air Force Base located in Florida. The contract is subject to annual economic price adjustments. ASUS is expected to begin operations at Eglin Air Force Base under its ECUS subsidiary in the spring of 2017.

ASUS has experienced delays in redetermining prices as required by the terms of these 50-year contracts. Interim rate increases have, at times, been implemented pending the outcome of these price redeterminations. Because of the delays, price

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redeterminations, when finally approved, can be retrospective and prospective. During 2016, the U.S. government approved various price redeterminations and/or economic price adjustments at four of the bases served. ASUS received approval from the U.S. government for these price redeterminations and/or economic price adjustments, which, in some cases, included retroactive operation and maintenance management fees for prior periods. In December 2016, ASUS recorded approximately \$421,000 in retroactive operation and maintenance management fees and pretax operating income related to periods prior to 2016. During the third quarter of 2015, the U.S. government approved various price redeterminations, as well as asset transfers, which included retroactive operation and maintenance management fees for prior periods. As such, ASUS recorded approximately \$3.0 million of retroactive revenues and pretax operating income during 2015 in connection with these contract modifications related to periods prior to 2015.

Costs and estimated earnings on contracts and amounts due from the U.S. government as of December 31, 2016 and 2015 are as follows:

(dollars in thousands)	2016	2015
Revenues (costs and estimated earnings) recognized on contracts	\$ 104,830	\$ 111,397
Less: Billings to date on contracts	(43,161)	(61,662)
	<u>\$ 61,669</u>	<u>\$ 49,735</u>
<u>Included in the accompanying balance sheets under the following captions:</u>		
Costs and estimated earnings in excess of billings on contracts	\$ 63,932	\$ 53,499
Billings in excess of costs and estimated earnings on contracts	(2,263)	(3,764)
	<u>\$ 61,669</u>	<u>\$ 49,735</u>
<u>Receivables from the U.S. government:</u>		
Billed receivables from the U.S. government	\$ 8,467	\$ 5,861
Unbilled receivables from the U.S. government (current)	6,691	1,309
Total	<u>\$ 15,158</u>	<u>\$ 7,170</u>

Note 6 — Earnings Per Share and Capital Stock

In accordance with the accounting guidance for participating securities and earnings per share (“EPS”), Registrant uses the “two-class” method of computing EPS. The “two-class” method is an earnings allocation formula that determines EPS for each class of common stock and participating security. AWR has participating securities related to restricted stock units that earn dividend equivalents on an equal basis with AWR’s Common Shares that have been issued under AWR’s 2000, 2008 and 2016 employee plans, and the 2003 and 2013 directors’ plans. In applying the “two-class” method, undistributed earnings are allocated to both common shares and participating securities.

The following is a reconciliation of Registrant’s net income and weighted average Common Shares outstanding for calculating basic net income per share:

Basic: (in thousands, except per share amounts)	For The Years Ended December 31,		
	2016	2015	2014
Net income	\$ 59,743	\$ 60,484	\$ 61,058
Less: (a) Distributed earnings to common shareholders	33,408	32,690	32,125
Distributed earnings to participating securities	187	207	177
Undistributed earnings	26,148	27,587	28,756
(b) Undistributed earnings allocated to common shareholders	26,003	27,414	28,599
Undistributed earnings allocated to participating securities	145	173	157
Total income available to common shareholders, basic (a)+(b)	\$ 59,411	\$ 60,104	\$ 60,724
Weighted average Common Shares outstanding, basic	36,552	37,389	38,658
Basic earnings per Common Share	\$ 1.63	\$ 1.61	\$ 1.57

Diluted EPS is based upon the weighted average number of Common Shares, including both outstanding shares and shares potentially issuable in connection with stock options and restricted stock units granted under AWR’s 2000, 2008 and 2016 employee plans, and the 2003 and 2013 directors’ plans, and net income. At December 31, 2016, there were 136,560 stock options outstanding under these plans. At December 31, 2016, there were also 209,932 restricted stock units outstanding including performance shares awarded to officers of the Registrant.

The following is a reconciliation of Registrant’s net income and weighted average Common Shares outstanding for calculating diluted net income per share:

Diluted: (in thousands, except per share amounts)	For The Years Ended December 31,		
	2016	2015	2014
Common shareholders earnings, basic	\$ 59,411	\$ 60,104	\$ 60,724
Undistributed earnings for dilutive stock options and restricted stock units	145	173	157
Total common shareholders earnings, diluted	\$ 59,556	\$ 60,277	\$ 60,881
Weighted average Common Shares outstanding, basic	36,552	37,389	38,658
Stock-based compensation (1)	198	225	222
Weighted average Common Shares outstanding, diluted	36,750	37,614	38,880
Diluted earnings per Common Share	\$ 1.62	\$ 1.60	\$ 1.57

(1) In applying the treasury stock method of reflecting the dilutive effect of outstanding stock-based compensation in the calculation of diluted EPS, 136,560 stock options and 209,932 restricted stock units, including performance awards, at December 31, 2016 were deemed to be outstanding in accordance with accounting guidance on earnings per share.

During the years ended December 31, 2016, 2015 and 2014, AWR issued Common Shares totaling 56,900, 53,612 and 74,145, respectively, under AWR’s Common Share Purchase and Dividend Reinvestment Plan (“DRP”), the 2000, 2008 and

2016 employee plans, and the 2003 and 2013 directors' plans. As of December 31, 2016, there are 1,055,948 and 387,300 Common Shares authorized for issuance directly by AWR but unissued under the DRP and the 401(k) Plan, respectively. Shares reserved for the 401(k) Plan are in relation to AWR's matching contributions and investment by participants. In addition, during the years ended December 31, 2016, 2015 and 2014, AWR issued 12,546, 66,458 and 37,006 Common Shares for approximately \$235,000, \$1,198,000 and \$589,000, respectively, as a result of the exercise of stock options. During 2016, 2015 and 2014, no cash proceeds received by AWR as a result of the exercise of stock options were distributed to any subsidiaries of AWR.

In 2014 and 2015, AWR's Board of Directors approved two stock repurchase programs, authorizing AWR to repurchase up to 2.45 million shares of its Common Shares. Both programs were completed during 2015. Under these programs, Registrant repurchased 1,905,000 and 545,000 Common Shares on the open market during 2015 and 2014, respectively.

GSWC's outstanding Common Shares are owned entirely by its parent, AWR. To the extent GSWC does not reimburse AWR for stock-based compensation awarded under various stock compensation plans, such amounts increase the value of GSWC's common shareholder's equity.

Note 7 — Dividend Limitations

GSWC is subject to contractual restrictions on its ability to pay dividends. GSWC's maximum ability to pay dividends is restricted by certain Note Agreements to the sum of \$21.0 million plus 100% of consolidated net income from various dates plus the aggregate net cash proceeds received from capital stock offerings or other instruments convertible into capital stock from various dates. Under the most restrictive of the Note Agreements, \$374.8 million was available to pay dividends to AWR as of December 31, 2016. GSWC is also prohibited from paying dividends if, after giving effect to the dividend, its total indebtedness to capitalization ratio (as defined) would be more than 0.6667-to-1. Dividends in the amount of \$25.5 million, \$62.0 million and \$52.0 million were paid to AWR by GSWC during the years ended December 31, 2016, 2015 and 2014, respectively.

The ability of AWR, ASUS and GSWC to pay dividends is also restricted by California law. Under California law, AWR, GSWC and ASUS are each permitted to distribute dividends to its shareholders so long as the Board of Directors determines, in good faith, that either: (i) the value of the corporation's assets equals or exceeds the sum of its total liabilities immediately after the dividend, or (ii) its retained earnings equals or exceeds the amount of the distribution. Under the least restrictive of the California tests, approximately \$247.1 million was available to pay dividends to AWR's shareholders at December 31, 2016. Approximately \$206.3 million was available for GSWC to pay dividends to AWR at December 31, 2016. Approximately \$57.2 million was available for ASUS to pay dividends to AWR as of December 31, 2016 to the extent that the subsidiaries of ASUS are able to pay dividends in that amount to ASUS under applicable state laws.

Note 8 — Bank Debt

AWR has access to a syndicated credit facility, which expires in May 2018. In October 2016, AWR elected to increase the aggregate commitment as permitted under the terms of the facility agreement from \$100.0 million to \$150.0 million. The aggregate effective amount that may be outstanding under letters of credit is \$25.0 million. AWR has obtained letters of credit, primarily for GSWC, in the aggregate amount of \$9.9 million, with fees of 0.65% including: (i) a \$5.4 million letter of credit representing a percentage of the outstanding American Recovery and Reinvestment Act ("ARRA") funds received by GSWC for reimbursement of capital costs related to the installation of meters in GSWC's Arden-Cordova water system, (ii) letters of credit in an aggregate amount of \$340,000 as security for GSWC's business automobile insurance policy, (iii) a letter of credit, in an amount of \$585,000 as security for the purchase of power, (iv) a \$15,000 irrevocable letter of credit pursuant to a franchise agreement with the City of Rancho Cordova, and (v) an irrevocable letter of credit in the amount of \$3.6 million, pursuant to a settlement agreement with Southern California Edison Company to cover GSWC's commitment to pay the settlement amount. Letters of credit outstanding reduce the amount that may be borrowed under the revolving credit facility. There were no compensating balances required.

Loans can be obtained at the option of AWR and bear interest at rates based on credit ratings and Euro rate margins. In April 2016, Standard & Poor's Rating Services ("S&P") affirmed the A+ credit rating and stable outlook on both AWR and GSWC. S&P's debt ratings range from AAA (highest rating possible) to D (obligation is in default). In December 2016, Moody's Investors Service ("Moody's") affirmed its A2 rating with a stable outlook for GSWC.

At December 31, 2016, there was \$90.0 million outstanding under this facility. At times, AWR borrows under this facility and provides loans to its subsidiaries in support of their operations, on terms that are similar to that of the credit facility.

AWR's short-term borrowing activities (excluding letters of credit) for the years ending December 31, 2016 and 2015 were as follows:

(in thousands, except percent)	December 31,	
	2016	2015
Balance Outstanding at December 31,	\$ 90,000	\$ 28,000
Interest Rate at December 31,	1.46%	1.09%
Average Amount Outstanding	\$ 59,261	\$ 4,112
Weighted Average Annual Interest Rate	1.20%	0.92%
Maximum Amount Outstanding	\$ 96,000	\$ 37,000

All of the letters of credit are issued pursuant to the syndicated revolving credit facility. The syndicated revolving credit facility contains restrictions on prepayments, disposition of property, mergers, liens and negative pledges, indebtedness and guaranty obligations, transactions with affiliates, minimum interest coverage requirements, a maximum debt to capitalization ratio and a minimum debt rating. Pursuant to the credit agreement, AWR must maintain a minimum interest coverage ratio of 3.25 times interest expense, a maximum total funded debt ratio of 0.65 to 1.00 and a minimum Moody's Investor Service or S&P debt rating of Baa3 or BBB-, respectively. As of December 31, 2016, 2015 and 2014, AWR was in compliance with these requirements. As of December 31, 2016, AWR had an interest coverage ratio of 7.07 times interest expense, a debt ratio of 0.46 to 1.00 and a debt rating of A+ by S&P.

Note 9 — Long-Term Debt

Registrant's long-term debt consists primarily of notes and debentures of GSWC. Registrant summarizes its long-term debt in the Statements of Capitalization. GSWC does not currently have any outstanding mortgages or other encumbrances on its properties. GSWC's leases and other similar financial arrangements are not material.

Each of the private placement notes issued by GSWC contain various restrictions. Private placement notes issued in the amount of \$28 million due in 2031 contain restrictions on the payment of dividends, minimum interest coverage requirements, a maximum total indebtedness to capitalization ratio and a negative pledge. Pursuant to the terms of these notes, GSWC must maintain a minimum interest coverage ratio of two times interest expense. As of December 31, 2016, GSWC had an interest coverage ratio of over four times interest expense. Other private placement notes issued by GSWC have similar requirements related to the maintenance of a total indebtedness to capitalization ratio, as discussed below.

In December 2014, GSWC issued \$15.0 million in 3.45% private placement senior notes due in 2029. In 2005 and 2009, GSWC issued two senior private placement notes to CoBank, ACB ("CoBank") due in 2028 and 2019, respectively. Pursuant to the terms of these three notes, GSWC must maintain a total indebtedness to capitalization ratio (as defined) of less than 0.6667-to-1 and a total indebtedness to earnings before income taxes, depreciation and amortization (EBITDA) of less than 8-to-1. As of December 31, 2016, GSWC had a total indebtedness to capitalization ratio of 0.4680-to-1 and a total indebtedness to EBITDA of 2.9-to-1.

Certain long-term debt issues outstanding as of December 31, 2016 can be redeemed, in whole or in part, at the option of GSWC subject to redemption schedules embedded in the agreements particular to each redeemable issue. With the exception of the 9.56% notes and the two senior notes issued to Co-Bank, as of December 31, 2016, the redemption premiums in effect are now zero. The 9.56% notes are subject to a make-whole premium based on 55 basis points above the applicable Treasury Yield if redeemed prior to 2021. After 2021, the maximum redemption premium is 3% of par value. The senior notes with Co-Bank are subject to a make-whole premium based on the difference between Co-Bank's cost of funds on the date of purchase and Co-Bank's cost of funds on the date of redemption, plus 0.5%. The \$15.0 million, 3.45% senior notes due in 2029 have similar redemption premiums.

In October 2009, GSWC entered into an agreement with the California Department of Health ("CDPH") whereby CDPH agreed to provide funds to GSWC of up to \$9.0 million under the American Recovery and Reinvestment Act. Proceeds from the funds received were used to reimburse GSWC for capital costs incurred to install water meters to convert customers in GSWC's Arden-Cordova district from non-metered service to metered service. GSWC received a total of \$8.6 million in reimbursements from the CDPH, half of which was recorded as a contribution in aid of construction and the other half as long-term debt in accordance with the terms of the agreement. The loan portion bears interest at a rate of 2.5% and is payable over 20 years beginning in 2013. A surcharge to recover from customers the debt service cost on this loan was approved by the

CPUC and implemented in 2013. Pursuant to the agreement, GSWC also issued letters of credit to CDPH equal to 80% of the amount loaned to GSWC. As of December 31, 2016, GSWC has a total of \$5.4 million in letters of credit issued to CDPH.

Annual maturities of all long-term debt, including capitalized leases, at December 31, 2016 are as follows (in thousands):

	Maturity as of December 31,
2017	\$ 330
2018	325
2019	40,322
2020	346
2021	365
Thereafter	283,894
Total	\$ 325,582

Note 10 — Taxes on Income

Registrant provides deferred income taxes for temporary differences under the accounting guidance for income taxes for certain transactions which are recognized for income tax purposes in a period different from that in which they are reported in the financial statements. The most significant items are the tax effects of differences in asset basis (including accelerated depreciation and capitalization methods), certain regulatory balancing accounts and advances for, and contributions in aid of, construction. The accounting guidance for income taxes also requires that rate-regulated enterprises record deferred income taxes for temporary differences given flow-through treatment at the direction of a regulatory commission. The resulting deferred tax assets and liabilities are recorded at the expected cash flow to be reflected in future rates. Given that the CPUC has consistently permitted the recovery of flowed-through tax effects, GSWC has established regulatory liabilities and assets offsetting such deferred tax assets and liabilities (Note 2). Deferred investment tax credits ("ITC") are amortized ratably to deferred tax expense over the lives of the property giving rise to the credits.

GSWC is included in AWR's consolidated federal income tax and combined California state franchise tax returns. California unitary apportionment provides a benefit or detriment to AWR's state taxes, depending on a combination of the profitability of AWR's non-California activities as well as the proportion of its California sales to total sales. Consistent with the method adopted for regulatory purposes, GSWC's tax expense is computed as if GSWC were autonomous and files separate returns. Given that all of GSWC's activities are conducted within California, GSWC's state tax expense does not reflect apportionment of its income.

As a regulated utility, GSWC treats certain temporary differences as flow-through adjustments in computing its income tax provision consistent with the income tax approach approved by the CPUC for ratemaking purposes. Flow-through adjustments increase or decrease tax expense in one period, with an offsetting decrease or increase occurring in another period. Giving effect to these temporary differences as flow-through adjustments typically results in a greater variance between the effective tax rate ("ETR") and the statutory federal income tax rate in any given period than would otherwise exist if GSWC were not required to account for its income taxes as a regulated enterprise. The GSWC ETRs deviate from the statutory rate primarily due to state taxes and differences between book and taxable income that are treated as flow-through adjustments in accordance with regulatory requirements (principally plant-, rate-case- and compensation-related items). The ETRs at the AWR consolidated level also fluctuate as a result of ASUS's state income taxes, which vary among the jurisdictions in which it operates, and certain permanent differences.

Changes in Tax Law:

In December 2015, the Protecting Americans From Tax Hikes Act of 2015 extended bonus depreciation for qualifying property through 2019. For 2015 through 2017, bonus depreciation was extended at a 50% rate. For 2018-2019, bonus depreciation will be phased down to 40% and 30%, respectively. Although the change in law reduces AWR's current taxes payable over these years, it does not reduce its total income tax expense or ETR.

The significant components of the deferred tax assets and liabilities as reflected in the balance sheets at December 31, 2016 and 2015 are:

(dollars in thousands)	AWR		GSWC	
	December 31,		December 31,	
	2016	2015	2016	2015
Deferred tax assets:				
Regulatory-liability-related: ITC	\$ 903	\$ 952	\$ 903	\$ 952
Regulatory-liability-related: California Corp Franchise Tax	3,365	4,530	3,365	4,530
Other non-property-related	1,993	2,486	1,901	1,997
Contributions and advances	7,464	8,026	7,712	8,026
	<u>\$ 13,725</u>	<u>\$ 15,994</u>	<u>\$ 13,881</u>	<u>\$ 15,505</u>
Deferred tax liabilities:				
Fixed assets	\$ (200,378)	\$ (178,004)	\$ (203,133)	\$ (179,660)
Regulatory-asset-related: depreciation and other	(24,402)	(21,658)	(24,402)	(21,658)
California Corp Franchise Tax	(2,033)	(2,440)	(2,208)	(3,051)
Other property-related	—	(66)	(68)	(65)
Balancing and memorandum accounts	(7,010)	(1,824)	(7,271)	(1,824)
Deferred charges	(4,429)	(4,849)	(4,597)	(4,905)
	<u>(238,252)</u>	<u>(208,841)</u>	<u>(241,679)</u>	<u>(211,163)</u>
Accumulated deferred income taxes - net	<u>\$ (224,527)</u>	<u>\$ (192,847)</u>	<u>\$ (227,798)</u>	<u>\$ (195,658)</u>

The current and deferred components of income tax expense are as follows:

(dollars in thousands)	AWR		
	Year Ended December 31,		
	2016	2015	2014
Current			
Federal	\$ 2,297	\$ 21,866	\$ 5,595
State	4,798	5,442	137
Total current tax expense	<u>\$ 7,095</u>	<u>\$ 27,308</u>	<u>\$ 5,732</u>
Deferred			
Federal	\$ 26,715	\$ 8,948	\$ 24,815
State	925	1,475	7,501
Total deferred tax expense	<u>27,640</u>	<u>10,423</u>	<u>32,316</u>
Total income tax expense	<u>\$ 34,735</u>	<u>\$ 37,731</u>	<u>\$ 38,048</u>
GSWC			
Year Ended December 31,			
(dollars in thousands)			
Current			
Federal	\$ (3,115)	\$ 16,196	\$ 408
State	3,625	5,557	(2,754)
Total current tax expense	<u>\$ 510</u>	<u>\$ 21,753</u>	<u>\$ (2,346)</u>
Deferred			
Federal	\$ 25,864	\$ 8,536	\$ 24,373
State	2,235	2,183	9,979
Total deferred tax expense	<u>28,099</u>	<u>10,719</u>	<u>34,352</u>
Total income tax expense	<u>\$ 28,609</u>	<u>\$ 32,472</u>	<u>\$ 32,006</u>

The reconciliations of the effective tax rates to the federal statutory rate are as follows:

(dollars in thousands, except percent)	AWR		
	Year Ended December 31,		
	2016	2015	2014
Federal taxes on pretax income at statutory rate	\$ 33,067	\$ 34,375	\$ 34,687
Increase (decrease) in taxes resulting from:			
State income tax, net of federal benefit	3,029	4,843	4,781
Flow-through on fixed assets	994	626	651
Flow-through on pension costs	(247)	267	(507)
Flow-through on removal costs	(2,068)	(929)	(1,571)
Domestic production activities deduction	(78)	(1,560)	(643)
Investment tax credit	(83)	(88)	(91)
Other – net	121	197	741
Total income tax expense from operations	\$ 34,735	\$ 37,731	\$ 38,048
Pretax income from operations	\$ 94,478	\$ 98,215	\$ 99,106
Effective income tax rate	36.8%	38.4%	38.4%
(dollars in thousands, except percent)	GSWC		
	Year Ended December 31,		
	2016	2015	2014
Federal taxes on pretax income at statutory rate	\$ 26,452	\$ 28,022	\$ 27,952
Increase (decrease) in taxes resulting from:			
State income tax, net of federal benefit	3,118	5,151	4,693
Flow-through on fixed assets	994	626	651
Flow-through on pension costs	(247)	267	(507)
Flow-through on removal costs	(2,068)	(929)	(1,571)
Domestic production activities deduction	—	(1,268)	(55)
Investment tax credit	(82)	(88)	(91)
Other – net	442	691	934
Total income tax expense from operations	\$ 28,609	\$ 32,472	\$ 32,006
Pretax income from operations	\$ 75,578	\$ 80,063	\$ 79,863
Effective income tax rate	37.9%	40.6%	40.1%

AWR and GSWC had no unrecognized tax benefits at December 31, 2016, 2015 and 2014.

Registrant’s policy is to classify interest on income tax over/underpayments in interest income/expense and penalties in “other operating expenses.”

At December 31, 2016, 2015 and 2014, AWR included \$461,000, \$504,000 and \$504,000, respectively, of net interest receivables from taxing authorities in other current and noncurrent assets. AWR recognized no interest income or expense during the year ended December 31, 2015, and recognized \$8,000 and \$19,000 of interest income during the years ended December 31, 2016 and 2014, respectively. At December 31, 2016, 2015 and 2014, GSWC included \$499,000, \$512,000 and \$472,000, respectively, of net interest receivables from taxing authorities in other current and noncurrent assets. GSWC recognized \$3,000 of interest expense during the year ended December 31, 2015, and \$7,000 and \$14,000 of interest income from taxing authorities during the years ended December 31, 2016 and 2014, respectively.

At December 31, 2016, 2015 and 2014, Registrant had no significant accruals for income-tax-related penalties and had no significant income-tax-related penalties recognized during the years ended December 31, 2016, 2015 and 2014.

Registrant files federal and various state income tax returns. AWR’s federal 2010 through 2012 refund claims were examined during 2015, and the Internal Revenue Service (“IRS”) completed its examination of them in February 2016. Its 2013-2015 tax years remain subject to examination by the IRS. AWR has filed protective refund claims with the applicable state taxing authority for the 2002 through 2008 tax years in connection with the matters on the federal claims for these years and other state tax matters. During 2012, the California Franchise Tax Board commenced examining these claims. The 2009-2015 tax years remain subject to examination by state taxing authorities.

Note 11 — Employee Benefit Plans

Pension and Post-Retirement Medical Plans:

Registrant maintains a defined benefit pension plan (the “Pension Plan”) that provides eligible employees (those aged 21 and older, hired before January 1, 2011) monthly benefits upon retirement based on average salaries and length of service. The eligibility requirement to begin receiving these benefits is 5 years of vested service. The normal retirement benefit is equal to 2% of the five highest consecutive years’ average earnings multiplied by the number of years of credited service, up to a maximum of 40, reduced by a percentage of primary social security benefits. There is also an early retirement option. Annual contributions are made to the Pension Plan, which comply with the funding requirements of the Employee Retirement Income Security Act (“ERISA”). At December 31, 2016, Registrant had 957 participants in the Pension Plan.

In January 2011, the Board of Directors approved an amendment to the Pension Plan, closing the plan to employees hired after December 31, 2010. Employees hired or rehired after December 31, 2010 are eligible to participate in a defined contribution plan. Registrant's existing 401(k) Investment Incentive Program was amended to include this defined contribution plan. Under this plan, Registrant provides a contribution of 5.25% of eligible pay each pay period into investment vehicles offered by the plan’s trustee. Participants will be fully vested in this plan once the employee attains three years of service. Employees hired before January 1, 2011 continue to participate in and accrue benefits under the terms of the Pension Plan.

Registrant also provides post-retirement medical benefits for all active employees hired before February of 1995, through a medical insurance plan. Eligible employees, who retire prior to age 65, and/or their spouses, are able to retain the benefits under the plan for active employees until reaching age 65. Eligible employees upon reaching age 65, and those eligible employees retiring at or after age 65, and/or their spouses, receive coverage through a Medicare supplement insurance policy paid for by Registrant subject to an annual cap limit. Registrant’s post-retirement medical plan does not provide prescription drug benefits to Medicare-eligible employees and is not affected by the Medicare Prescription Drug Improvement and Modernization Act of 2003.

In accordance with the accounting guidance for the effects of certain types of regulation, Registrant has established a regulatory asset for its underfunded position in its pension and post-retirement medical plans that is expected to be recovered through rates in future periods. The changes in actuarial gains and losses, prior service costs and transition assets or obligations pertaining to the regulatory asset are recognized as an adjustment to the regulatory asset account as these amounts are recognized as components of net periodic pension costs each year.

The following table sets forth the Pension Plan’s and post-retirement medical plan’s funded status and amounts recognized in Registrant’s balance sheets and the components of net pension cost and accrued liability at December 31, 2016 and 2015:

(dollars in thousands)	Pension Benefits		Post-Retirement Medical Benefits	
	2016	2015	2016	2015
Change in Projected Benefit Obligation:				
Projected benefit obligation at beginning of year	\$ 168,934	\$ 185,184	\$ 9,393	\$ 12,326
Service cost	5,094	6,276	247	340
Interest cost	7,910	7,686	371	435
Actuarial (gain) loss	4,162	(24,413)	(715)	(3,375)
Benefits/expenses paid	(5,736)	(5,799)	(494)	(333)
Projected benefit obligation at end of year	\$ 180,364	\$ 168,934	\$ 8,802	\$ 9,393
Changes in Plan Assets:				
Fair value of plan assets at beginning of year	\$ 142,174	\$ 140,561	\$ 10,614	\$ 10,723
Actual return on plan assets	9,182	673	418	115
Employer contributions	5,252	6,739	—	109
Benefits/expenses paid	(5,736)	(5,799)	(494)	(333)
Fair value of plan assets at end of year	\$ 150,872	\$ 142,174	\$ 10,538	\$ 10,614
Funded Status:				
Net amount recognized as accrued pension cost	\$ (29,492)	\$ (26,760)	\$ 1,736	\$ 1,221

(in thousands)	Pension Benefits		Post-Retirement Medical Benefits	
	2016	2015	2016	2015
Amounts recognized on the balance sheets:				
Non-current assets	\$ —	\$ —	\$ 1,736	\$ 1,221
Current liabilities	—	—	—	—
Non-current liabilities	(29,492)	(26,760)	—	—
Net amount recognized	\$ (29,492)	\$ (26,760)	\$ 1,736	\$ 1,221
Amounts recognized in regulatory assets consist of:				
Prior service cost (credit)	\$ —	\$ 49	\$ —	\$ (34)
Net (gain) loss	25,828	21,921	(5,515)	(5,572)
Regulatory assets (liabilities)	25,828	21,970	(5,515)	(5,606)
Unfunded accrued pension cost	3,664	4,790	3,779	4,385
Net liability (asset) recognized	\$ 29,492	\$ 26,760	\$ (1,736)	\$ (1,221)

Changes in plan assets and benefit obligations recognized in regulatory assets:

Regulatory asset at beginning of year	\$ 21,970	\$ 39,170	\$ (5,606)	\$ (3,125)
Net loss (gain)	4,818	(15,292)	(644)	(2,997)
Amortization of prior service (cost) credit	(49)	(118)	34	200
Amortization of net gain (loss)	(911)	(1,790)	701	316
Total change in regulatory asset	3,858	(17,200)	91	(2,481)
Regulatory asset (liability) at end of year	\$ 25,828	\$ 21,970	\$ (5,515)	\$ (5,606)
Net periodic pension costs	\$ 4,126	\$ 6,075	\$ (606)	\$ (234)
Change in regulatory asset	3,858	(17,200)	91	(2,481)
Total recognized in net periodic pension cost and regulatory asset (liability)	\$ 7,984	\$ (11,125)	\$ (515)	\$ (2,715)

Estimated amounts that will be amortized from regulatory asset over the next fiscal year:

Prior service (cost) credit	\$ —	\$ (49)	\$ —	\$ 34
Net gain (loss)	\$ (835)	\$ (510)	\$ 679	\$ 599

Additional year-end information for plans with an accumulated benefit obligation in excess of plan assets:

Projected benefit obligation	\$ 180,364	\$ 168,934	\$ 8,802	\$ 9,393
Accumulated benefit obligation	\$ 165,998	\$ 155,469	N/A	N/A
Fair value of plan assets	\$ 150,872	\$ 142,174	\$ 10,538	\$ 10,614

Weighted-average assumptions used to determine benefit obligations at December 31:

Discount rate	4.44%	4.65%	3.97%	4.25%
Rate of compensation increase	*	*	N/A	N/A

* Age-graded ranging from 3.0% to 8.0%.

Consistent with decisions from the CPUC and in accordance with regulatory accounting principles, Registrant capitalizes a portion of its pension and other post-retirement costs in the overhead pool included in GSWC's utility plant. The components of net periodic pension and post-retirement benefits cost, before allocation to the overhead pool, for 2016, 2015 and 2014 are as follows:

(dollars in thousands, except percent)	Pension Benefits			Post-Retirement Medical Benefits		
	2016	2015	2014	2016	2015	2014
Components of Net Periodic Benefits Cost:						
Service cost	\$ 5,094	\$ 6,276	\$ 5,643	\$ 247	\$ 340	\$ 348
Interest cost	7,910	7,686	7,520	371	435	495
Expected return on plan assets	(9,838)	(9,795)	(8,898)	(489)	(493)	(453)
Amortization of transition	—	—	—	—	—	418
Amortization of prior service cost (credit)	49	118	118	(34)	(200)	(200)
Amortization of actuarial (gain) loss	911	1,790	—	(701)	(316)	(330)
Net periodic pension cost under accounting standards	\$ 4,126	\$ 6,075	\$ 4,383	\$ (606)	\$ (234)	\$ 278
Regulatory adjustment - over collection	859	523	1,622	—	—	—
Total expense recognized, before allocation to overhead pool	\$ 4,985	\$ 6,598	\$ 6,005	\$ (606)	\$ (234)	\$ 278

Weighted-average assumptions used to determine net periodic cost:

Discount rate	4.65%	4.25%	5.10%	4.25%	3.80%	4.65%
Expected long-term return on plan assets	7.00%	7.00%	7.00%	*	*	*
Rate of compensation increase	**	4.00%	4.00%	N/A	N/A	N/A

*7.0% for union plan, 4.2% for non-union, net of income taxes in 2016, 2015 and 2014.

** Age-graded ranging from 3.0% to 8.0%.

Regulatory Adjustment:

The CPUC authorized GSWC to track differences between the forecasted annual pension expenses adopted in rates for its water regions and the general office and the actual annual expense to be recorded by GSWC in accordance with the accounting guidance for pension costs. During the years ended December 31, 2016, 2015, and 2014 GSWC's actual expense was lower than the amounts included in water and electric customer rates by \$859,000, \$523,000 and \$1.6 million, respectively. These over-collections have been recorded in the two-way pension balancing accounts included in regulatory assets. As of December 31, 2016, the pension balancing account had a \$1.3 million net under-collection included in regulatory assets.

Plan Funded Status:

The Pension Plan was underfunded at December 31, 2016 and 2015. Registrant's market related value of plan assets is equal to the fair value of plan assets. Past volatile market conditions have affected the value of GSWC's trust established to fund its future long-term pension benefits. These benefit plan assets and related obligations are measured annually using a December 31 measurement date. Changes in the plan's funded status will affect the assets and liabilities recorded on the balance sheet in accordance with accounting guidance on employers' accounting for defined benefit pension and other post-retirement plans. Due to Registrant's regulatory recovery treatment, the recognition of the funded status is offset by a regulatory asset pursuant to guidance on accounting for the effects of certain types of regulation.

Plan Assets:

The assets of the pension and post-retirement medical plans are managed by a third party trustee. The investment policy allocation of the assets in the trust was approved by Registrant’s Administrative Committee (the “Committee”) for the pension and post-retirement medical funds, which has oversight responsibility for all retirement plans. The primary objectives underlying the investment of the pension and post-retirement plan assets are: (i) attempt to maintain a fully funded status with a cushion for unexpected developments, possible future increases in expense levels, and/or a reduction in the expected return on investments, (ii) seek to earn long-term returns that compare favorably to appropriate market indexes, peer group universes and the policy asset allocation index, (iii) seek to provide sufficient liquidity to pay current benefits and expenses, (iv) attempt to limit risk exposure through prudent diversification, and (v) seek to limit costs of administering and managing the plans.

The Committee recognizes that risk and volatility are present to some degree with all types of investments. High levels of risk may be avoided through diversification by asset class, style of each investment manager and sector and industry limits. Investment managers are retained to manage a pool of assets and allocate funds in order to achieve an appropriate, diversified and balanced asset mix. The Committee’s strategy balances the requirement to maximize returns using potentially higher return generating assets, such as equity securities, with the need to control the risk of its benefit obligations with less volatile assets, such as fixed income securities.

The Committee approves the target asset allocations. Registrant’s pension and post-retirement plan weighted-average asset allocations at December 31, 2016 and 2015, by asset category are as follows:

Asset Category	Pension Benefits		Post-Retirement Medical Benefits	
	2016	2015	2016	2015
Actual Asset Allocations:				
Equity securities	57%	55%	58%	60%
Debt securities	38%	40%	39%	38%
Real Estate Funds	5%	5%	—%	—%
Cash equivalents	—%	—%	3%	2%
Total	100%	100%	100%	100%

Equity securities did not include AWR’s Common Shares as of December 31, 2016 and 2015.

Target Asset Allocations for 2016:	Pension Benefits	Post-retirement Medical Benefits
Equity securities	60%	60%
Debt securities	40%	40%
Total	100%	100%

The Committee appointed a management firm to manage the Pension Plan assets effective February 2015. During 2015, the pension plan assets were allocated to collective trust funds managed by the management firm. The fair value of these collective trust funds are measured using net asset value per share. In accordance with ASU 2015-07 *Disclosures for Investments in Certain Entities that Calculate Net Asset Value per Share (or Its Equivalents)*, the fair value of the collective trust funds are not categorized in the fair value hierarchy as of December 31, 2016.

The following tables set forth the fair value, measured by net asset value, of the pension investment assets as of December 31, 2016 and 2015:

(dollars in thousands)	Net Asset Value as of December 31, 2016			
	Fair Value	Unfunded Commitments	Redemption Frequency	Redemption Notice Period
Cash equivalents	\$ 500	—	N/A	N/A
Fixed income fund	57,674	—	Daily	Daily
<u>Equity securities:</u>				
U.S. small/mid cap funds	24,312	—	Daily	Daily
U.S. large cap funds	46,175	—	Daily	Daily
International funds	14,869	—	Daily	Daily
Total equity funds	85,356	—		
Real estate funds	7,342	—	Daily	Daily
Total	\$ 150,872	—		

(dollars in thousands)	Net Asset Value as of December 31, 2015			
	Fair Value	Unfunded Commitments	Redemption Frequency	Redemption Notice Period
Cash equivalents	\$ 469	—	N/A	N/A
Fixed income fund	56,218	—	Daily	Daily
<u>Equity securities:</u>				
U.S. small/mid cap funds	21,219	—	Daily	Daily
U.S. large cap funds	42,395	—	Daily	Daily
International funds	14,455	—	Daily	Daily
Total equity funds	78,069	—		
Real estate funds	7,418	—	Daily	Daily
Total	\$ 142,174	—		

The collective trust funds may be invested or redeemed daily, and generally do not have any significant restrictions to redeem the investments.

As previously discussed in Note 4, accounting guidance for fair value measurements establishes a framework for measuring fair value and requires fair value measurements to be classified and disclosed in one of three levels. As required by the accounting guidance, assets and liabilities are classified in their entirety based on the lowest level of input that is significant to the fair value measurement. All equity investments in the post-retirement medical plan are Level 1 investments in mutual funds. The fixed income category includes corporate bonds and notes. The majority of fixed income investments range in maturities from less than one to twenty years. The fair values of these investments are based on quoted market prices in active markets.

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The following tables set forth by level, within the fair value hierarchy, the post-retirement plan's investment assets measured at fair value as of December 31, 2016 and 2015:

(dollars in thousands)	Fair Value as of December 31, 2016			
	Level 1	Level 2	Level 3	Total
Fair Value of Post-Retirement Plan Assets:				
Cash equivalents	\$ 360	—	—	\$ 360
Fixed income	4,072	—	—	4,072
U.S. equity securities (large cap stocks)	6,106	—	—	6,106
Total investments measured at fair value	\$ 10,538	—	—	\$ 10,538

(dollars in thousands)	Fair Value as of December 31, 2015			
	Level 1	Level 2	Level 3	Total
Fair Value of Post-Retirement Plan Assets:				
Cash equivalents	\$ 31	—	—	\$ 31
Fixed income	4,182	—	—	4,182
U.S. equity securities (large cap stocks)	6,401	—	—	6,401
Total investments measured at fair value	\$ 10,614	—	—	\$ 10,614

Plan Contributions:

During 2016, Registrant contributed \$5.3 million to its pension plan and did not make a contribution to the post-retirement medical plan. Registrant currently expects to contribute approximately \$6.2 million to its pension plan in 2017. Registrant's policy is to fund the plans annually at a level which is deductible for income tax purposes and is consistent with amounts recovered in customer rates.

Benefit Payments:

Estimated future benefit payments at December 31, 2016 for the next five years and thereafter are as follows (in thousands):

	Pension Benefits	Post-Retirement Medical Benefits
2017	\$ 6,385	\$ 560
2018	6,855	609
2019	7,354	633
2020	7,945	680
2021	8,542	768
Thereafter	51,307	3,719
Total	\$ 88,388	\$ 6,969

Assumptions:

Certain actuarial assumptions, such as the discount rate, long-term rate of return on plan assets, mortality, and the healthcare cost trend rate have a significant effect on the amounts reported for net periodic benefit cost as well as the related benefit obligation amounts. During 2015, Registrant updated other key assumptions used for the valuation of the pension, post-retirement medical and supplemental executive retirement plans. These updates included: (i) updates in demographic assumptions, such as retirement and termination rates, to reflect recent changes in participant behavior, and (ii) salary increases based on Registrant's recent and future expected experience. These updates resulted in actuarial gains in the benefit obligations for the pension, post-retirement medical and supplemental executive retirement plans in 2015.

Discount Rate — The assumed discount rate for pension and post-retirement medical plans reflects the market rates for high-quality corporate bonds currently available. Registrant's discount rates were determined by considering the average of pension yield curves constructed of a large population of high quality corporate bonds. The resulting discount rate reflects the matching of plan liability cash flows to the yield curves.

Expected Long-Term Rate of Return on Assets — The long-term rate of return on plan assets represents an estimate of long-term returns on an investment portfolio consisting of a mixture of equities, fixed income and other investments. To develop the expected long-term rate of return on assets assumption for the pension plan, Registrant considered the historical returns and the future expectations for returns for each asset class, as well as the target asset allocation of the pension portfolio. Registrant’s policy is to fund the medical benefit trusts based on actuarially determined amounts as allowed in rates approved by the CPUC. Registrant has invested the funds in the post-retirement trusts that will achieve a desired return and minimize amounts necessary to recover through rates. The mix is expected to provide for a return on assets similar to the Pension Plan and to achieve Registrant’s targeted allocation. This resulted in the selection of the 7.0% long-term rate of return on assets assumption for the union plan and 4.2% (net of income taxes) for the non-union plan portion of the post-retirement plan.

Mortality — Mortality assumptions are a critical component of benefit obligation amounts and a key factor in determining the expected length of time for annuity payments. In 2014, the Society of Actuaries ("SOA") released new mortality tables for pension plans. Beginning with 2014, the benefit obligation amounts assumed a longer life expectancy of participants as a result of the actuarial update to mortality tables. In 2016, the SOA published updated mortality tables reflecting three additional years of data and refined certain parameters used in developing the 2014 tables. Accordingly, as of December 31, 2016, the benefit obligation amounts reflect updates to the 2014 mortality tables. The updates to the mortality tables, as compared to those used prior to 2014, are expected to increase future annual net periodic costs.

Healthcare Cost Trend Rate — The assumed health care cost trend rate for 2017 starts at 6.7% grading down to 4.7% in 2037 for those under age 65, and at 6.3% grading down to 4.5% in 2037 for those 65 and over. Assumed health care cost trend rates have a significant effect on the amounts reported for the health care plans. A one-percentage-point change in assumed health care cost trend rates would have the following effects on the post-retirement medical plan:

(dollars in thousands)	1-Percentage-Point Increase		1-Percentage-Point Decrease	
Effect on total of service and interest cost components	\$	55	\$	(47)
Effect on post-retirement benefit obligation	\$	914	\$	(790)

Supplemental Executive Retirement Plan:

Registrant has a supplemental executive retirement plan (“SERP”) that provides additional retirement benefits to certain key employees and officers of Registrant by making up benefits, which are limited by Sections 415 and 401(a)(17) of the Internal Revenue Code of 1986, as amended, and certain additional benefits. The Board of Directors approved the establishment of a Rabbi Trust created for the SERP. Assets in a Rabbi Trust can be subject to the claims of creditors; therefore, they are not considered as an asset for purposes of computing the SERP’s funded status. As of December 31, 2016, the balance in the Rabbi Trust totaled \$12.0 million and is included in Registrant’s other property and investments.

All equity investments in the Rabbi Trust are Level 1 investments in mutual funds. The fixed income category includes corporate bonds and notes. The fair values of these investments are based on quoted market prices in active markets. The following tables set forth by level, within the fair value hierarchy, the Rabbi Trust investment assets measured at fair value as of December 31, 2016 and 2015:

(dollars in thousands)	Fair Value as of December 31, 2016			
	Level 1	Level 2	Level 3	Total
Fair Value of Assets held in Rabbi Trust:				
Cash equivalents	\$ 46	—	—	\$ 46
Fixed income securities	4,801	—	—	4,801
Equity securities	7,149	—	—	7,149
Total investments measured at fair value	<u>\$ 11,996</u>	<u>—</u>	<u>—</u>	<u>\$ 11,996</u>

(dollars in thousands)	Fair Value as of December 31, 2015			
	Level 1	Level 2	Level 3	Total
Fair Value of Assets held in Rabbi Trust:				
Cash equivalents	\$ 39	—	—	\$ 39
Fixed income securities	3,903	—	—	3,903
Equity securities	5,924	—	—	5,924
Total investments measured at fair value	\$ 9,866	—	—	\$ 9,866

The following provides a reconciliation of benefit obligations, funded status of the SERP, as well as a summary of significant estimates at December 31, 2016 and 2015:

(dollars in thousands)	2016	2015
Change in Benefit Obligation:		
Benefit obligation at beginning of year	\$ 16,317	\$ 15,926
Service cost	799	814
Interest cost	743	653
Actuarial (gain) loss	3,341	(683)
Benefits paid	(417)	(393)
Benefit obligation at end of year	\$ 20,783	\$ 16,317
Changes in Plan Assets:		
Fair value of plan assets at beginning of year	—	—
Fair value of plan assets at end of year	—	—
Funded Status:		
Net amount recognized as accrued cost	\$ (20,783)	\$ (16,317)

The change in actuarial gain/loss in the SERP was due, in part, to a decrease in the discount rate during 2016, while the discount rate increased during 2015.

(in thousands)	2016	2015
Amounts recognized on the balance sheets:		
Current liabilities	\$ (419)	\$ (411)
Non-current liabilities	(20,364)	(15,906)
Net amount recognized	\$ (20,783)	\$ (16,317)
Amounts recognized in regulatory assets consist of:		
Prior service cost	\$ 11	\$ 36
Net loss	6,463	3,416
Regulatory assets	6,474	3,452
Unfunded accrued cost	14,309	12,865
Net liability recognized	\$ 20,783	\$ 16,317
Changes in plan assets and benefit obligations recognized in regulatory assets consist of:		
Regulatory asset at beginning of year	\$ 3,452	\$ 4,683
Net (gain) loss	3,339	(683)
Amortization of prior service credit	(25)	(117)
Amortization of net loss	(292)	(431)
Total change in regulatory asset	3,022	(1,231)
Regulatory asset at end of year	\$ 6,474	\$ 3,452
Net periodic pension cost	\$ 1,859	\$ 2,015
Change in regulatory asset	3,022	(1,231)
Total recognized in net periodic pension and regulatory asset	\$ 4,881	\$ 784
Estimated amounts that will be amortized from regulatory asset over the next fiscal year:		
Initial net asset (obligation)	\$ —	\$ —
Prior service cost	(11)	(25)
Net loss	(777)	(292)
Additional year-end information for plans with an accumulated benefit obligation in excess of plan assets:		
Projected benefit obligation	\$ 20,783	\$ 16,317
Accumulated benefit obligation	17,144	14,533
Fair value of plan assets	—	—
Weighted-average assumptions used to determine benefit obligations:		
Discount rate	4.34%	4.61%
Rate of compensation increase	4.00%	4.00%

The components of SERP expense, before allocation to the overhead pool, for 2016, 2015 and 2014 are as follows:

(dollars in thousands, except percent)	2016	2015	2014
Components of Net Periodic Benefits Cost:			
Service cost	\$ 799	\$ 814	\$ 768
Interest cost	743	653	615
Amortization of prior service cost	25	117	161
Amortization of net loss	292	431	139
Net periodic pension cost	\$ 1,859	\$ 2,015	\$ 1,683
Weighted-average assumptions used to determine net periodic cost:			
Discount rate	4.61%	4.15%	5.05%
Rate of compensation increase	4.00%	4.00%	4.00%

Benefit Payments: Estimated future benefit payments for the SERP at December 31, 2016 for the next ten years are as follows (in thousands):

2017	\$	419
2018		664
2019		731
2020		1,246
2021		1,302
Thereafter		6,714
Total	\$	11,076

401(k) Investment Incentive Program:

Registrant has a 401(k) Investment Incentive Program under which employees may invest a percentage of their pay, up to a maximum investment prescribed by law, in an investment program managed by an outside investment manager. Registrant's cash contributions to the 401(k) are based upon a percentage of individual employee contributions and for the years ended December 31, 2016, 2015 and 2014 were \$2.2 million, \$2.1 million and \$1.9 million, respectively. In 2011, this program was amended to incorporate the defined contribution plan previously discussed. Contributions to the defined contribution plan for the years ended December 31, 2016, 2015 and 2014 were \$951,000, \$755,000 and \$568,000, respectively.

Note 12 — Stock-Based Compensation Plans

Summary Description of Stock Incentive Plans

AWR currently has five stock incentive plans: the 2000, 2008 and 2016 employee plans for its employees, and the 2003 and 2013 directors plans for directors, each more fully described below.

2000, 2008 and 2016 Employee Plans — AWR adopted these employee plans, following shareholder approval, to provide stock-based incentive awards in the form of stock options, restricted stock units and restricted stock to employees as a means of promoting the success of Registrant by attracting, retaining and more fully aligning the interests of employees with those of customers and shareholders. The 2008 and 2016 employee plans also provide for the grant of performance awards. No additional grants may be made under the 2000 or 2008 employee plans.

For stock options, Registrant's Compensation Committee of the Board of Directors ("Compensation Committee") determines, among other things, the date of grant, the form, term, option exercise price, vesting and exercise terms of each option. Stock options granted by AWR have been in the form of nonqualified stock options, expire ten years from the date of grant, vest over a period of three years and are subject to earlier termination as provided in the form of option agreement approved by the Compensation Committee. The option price per share is determined by the Compensation Committee at the time of grant, but may not be less than the fair market value of Common Shares on the date of grant.

For restricted stock unit awards, the Compensation Committee determines the specific terms, conditions and provisions relating to each restricted stock unit. Each employee who has been granted a time-vested restricted stock unit is entitled to dividend equivalent rights in the form of additional restricted stock units until vesting of the time-vested restricted stock units. In general, time-vested restricted stock units vest over a period of three years. Restricted stock units may also vest upon retirement if the grantee is at least 55 and the sum of the grantee's age and years of service are equal to or greater than 75, or upon death or total disability. In addition, restricted stock units may vest following a change in control if the Company terminates the grantee other than for cause or the employee terminates employment for good reason. Each restricted stock unit is non-voting and entitles the holder of the restricted stock unit to receive one Common Share.

The Compensation Committee also has the authority to determine the number, amount or value of performance awards, the duration of the performance period or performance periods applicable to the award and the performance criteria applicable to each performance award for each performance period. Each outstanding performance award granted by the Compensation Committee has been in the form of restricted stock units that generally vest over a period of three years as provided in the performance award agreement. The amount of the performance award paid to an employee depends upon satisfaction of performance criteria is generally determined by the Compensation Committee following the end of a three-year performance period. Performance awards may also vest and be payable upon retirement if the grantee is at least 55 and the sum of the grantee's age and years of service are equal to or greater than 75, or upon death or total disability, with adjustments which

take into account the shortened performance period for death and disability. In addition, performance awards may vest following a change in control if the Company terminates the grantee other than for cause or the employee terminates employment for good reason, subject to adjustments which take into account the shortened performance period.

2003 and 2013 Directors Plans — The Board of Directors and shareholders of AWR have approved the 2003 and 2013 directors plans in order to provide the non-employee directors with supplemental stock-based compensation to encourage them to increase their stock ownership in AWR. No more grants may be made under the 2003 directors plan.

From 2009 through 2014, non-employee directors received restricted stock units equal to two times the annual retainer. Since 2014, non-employee directors are entitled to receive restricted stock units in an amount determined by the board of directors. This amount may not exceed two times the annual retainer paid to directors. One-third of the restricted stock units granted in 2009 through 2012 were payable to each non-employee director at the earlier of the first, second and third anniversaries of the date of grant and the date of termination of service as a director. Each non-employee director is entitled to receive restricted stock units granted after 2012 ninety days after the grant date. Restricted stock units credited to each non-employee director's restricted stock unit account are at all times fully vested and non-forfeitable.

No stock options have been granted to directors since AWR's 2006 annual meeting under the 2003 directors plan, and no stock options may be granted to directors under the 2013 directors plan.

All stock options, restricted stock units and performance awards have been granted with dividend equivalent rights payable in the form of additional restricted stock units.

Recognition of Compensation Expense

Registrant recognizes compensation expense related to the fair value of stock-based compensation awards. Share-based compensation cost is measured by the Registrant at the grant date, based on the calculated fair value of the award, and is recognized as an expense over the employee's requisite service period (generally the vesting period of the equity grant). Immediate vesting does occur if the employee is at least 55 years old and the sum of the employee's age and years of employment is equal to or greater than 75. Registrant assumes that pre-vesting forfeitures will be minimal, and recognizes pre-vesting forfeitures as they occur, which results in a reduction in compensation expense.

The following table presents share-based compensation expenses for the years ended December 31, 2016, 2015 and 2014. These expenses resulting from restricted stock units, including performance awards, are included in administrative and general expenses in AWR's and GSWC's statements of income:

(in thousands)	AWR			GSWC		
	For The Years Ended December 31,			For The Years Ended December 31,		
	2016	2015	2014	2016	2015	2014
Stock-based compensation related to:						
Restricted stock units	\$ 2,538	\$ 2,754	\$ 2,222	\$ 2,118	\$ 2,443	\$ 1,748
Total stock-based compensation expense	\$ 2,538	\$ 2,754	\$ 2,222	\$ 2,118	\$ 2,443	\$ 1,748

Equity-based compensation cost, capitalized as part of GSWC's utility plant for the years ended December 31, 2016, 2015 and 2014 was \$155,000, \$369,000 and \$255,000, respectively, for both AWR and GSWC. For the years ended December 31, 2016, 2015 and 2014, AWR realized approximately \$581,000, \$877,000 and \$533,000, respectively, of tax benefits from stock-based awards. For the years ended December 31, 2016, 2015 and 2014, GSWC realized approximately \$501,000, \$872,000 and \$514,000, respectively, of tax benefits from stock-based awards.

Registrant amortizes stock-based compensation over the requisite (vesting) period for the entire award. Options issued pursuant to the 2000 employee plan vest and are exercisable in installments of 33% the first two years and 34% in the third year, starting one year from the date of the grant and expire 10 years from the date of the grant. No stock options have been granted under the 2008 employee plan. Time-vesting restricted stock units vest and become nonforfeitable in installments of 33% the first two years and 34% in the third year, starting one year from the date of the grant. Outstanding performance awards vest and become nonforfeitable in installments of 33% the first two years and 34% in the third year, and are distributed at the end of the performance period if the performance criteria set forth in the award agreement are satisfied.

Stock Options — There were no stock options granted during the years 2016, 2015 or 2014. A summary of stock option activity as of December 31, 2016 and changes during the year ended December 31, 2016, are presented below:

	Number of Options	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value
Options outstanding at January 1, 2016	150,606	\$ 17.39		
Granted	—	—		
Exercised	(12,546)	18.75		
Forfeited or expired	(1,500)	16.87		
Options outstanding at December 31, 2016	136,560	\$ 17.27	1.92	\$ 3,863,731
Options exercisable at December 31, 2016	136,560	\$ 17.27	1.92	\$ 3,863,731

The aggregate intrinsic value in the table above represents the total pretax intrinsic value (i.e., the difference between the closing price of the Common Shares on the last trading day of the 2016 calendar year and the exercise price, times the number of shares) that would have been received by the option holders had all option holders exercised their option on December 31, 2016. This amount changes if the fair market value of the Common Shares changes. The total intrinsic value of options exercised during the years ended December 31, 2016, 2015 and 2014 was approximately \$308,000, \$1,457,000 and \$596,000, respectively.

During the years ended December 31, 2016, 2015 and 2014, Registrant received approximately \$235,000, \$1,198,000 and \$589,000, respectively, in cash proceeds from the exercise of its stock options.

Restricted Stock Units (Time-Vested) — A restricted stock unit (“RSU”) represents the right to receive a share of AWR’s Common Shares and are valued based on the fair market value of AWR’s Common Shares on the date of grant. The fair value of RSUs were determined based on the closing trading price of Common Shares on the grant date. A summary of the status of Registrant’s outstanding RSUs, excluding performance awards, to employees and directors as of December 31, 2016, and changes during the year ended December 31, 2016, is presented below:

	Number of Restricted Share Units	Weighted Average Grant-Date Value
Restricted share units at January 1, 2016	111,335	\$ 26.21
Granted	37,807	40.52
Vested	(40,555)	27.03
Forfeited	(858)	38.06
Restricted share units at December 31, 2016	107,729	\$ 30.83

As of December 31, 2016, there was approximately \$0.8 million of total unrecognized compensation cost related to restricted stock units granted under AWR’s employee and director’s stock plans. That cost is expected to be recognized over a weighted average period of 1.42 years.

Restricted Stock Units (Performance Awards) – During the years ended December 31, 2016, 2015 and 2014, the Compensation Committee granted performance awards in the form of restricted stock units to officers of the Registrant. A performance award represents the right to receive a share of AWR’s Common Shares if specified performance goals are met over the performance period specified in the grant (generally three years), subject to certain exceptions through the performance period. Each grantee of any outstanding performance award may earn between 0% and 200% of the target amount depending on Registrant’s performance against performance goals, which are determined by the Compensation Committee on the date of grant. As determined by the Compensation Committee, the performance awards granted during the years ended December 31, 2016, 2015 and 2014 included various performance-based conditions and one market-based condition related to total shareholder return (“TSR”) that will be earned based on Registrant’s TSR compared to the TSR for a specific peer group of investor-owned water companies.

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A summary of the status of Registrant's outstanding performance awards to officers as of December 31, 2016, and changes during the year ended December 31, 2016, is presented below:

	Number of Performance awards	Weighted Average Grant-Date Value
Performance awards at January 1, 2016	131,953	\$ 30.66
Granted	29,758	40.81
Performance criteria adjustment	(8,100)	28.09
Vested	(51,408)	27.82
Performance awards at December 31, 2016	102,203	\$ 35.25

A portion of the fair value of performance awards was estimated at the grant date based on the probability of satisfying the market-based condition using a Monte-Carlo simulation model, which assesses the probabilities of various outcomes of the market condition. The portion of the fair value of the performance awards associated with performance-based conditions was based on the fair market value of AWR's Common Shares at the grant date. The fair value of each outstanding performance award grant is amortized into compensation expense in installments of 33% the first two years and 34% in the third year of their respective vesting periods, which is generally over 3 years unless earlier vested pursuant to the terms of the agreement. The accrual of compensation costs is based on the estimate of the final expected value of the award, and is adjusted as required for the portion based on the performance-based condition. Unlike the awards with performance-based conditions, for the portion based on the market-based condition, compensation cost is recognized, and not reversed, even if the market condition is not achieved, as required by the accounting guidance for share-based awards. As of December 31, 2016, \$879,000 of unrecognized compensation costs related to performance awards is expected to be recognized over a weighted average period of 1.53 years.

Note 13 - Commitments**GSWC's Water Supply:**

GSWC obtains its water supply from its operating wells and purchases from others, principally member agencies of the Metropolitan Water District of Southern California ("MWD"). MWD is a public agency and quasi-municipal corporation created in 1928 by a vote of the electorates of several Southern California cities. MWD's primary purpose was and is to provide a supplemental supply of water for domestic and municipal uses and purposes at wholesale rates to its member public agencies. GSWC has connections to MWD's water distribution facilities and those of other member water agencies. MWD's principal sources of water are the State Water Project and the Colorado River.

GSWC has contracts to purchase water or water rights for an aggregate amount of \$5.3 million as of December 31, 2016. Included in the \$5.3 million is a commitment of \$2.7 million to lease water rights from a third party under an agreement which expires in 2028. The remaining \$2.6 million are commitments for purchased water with other third parties which expire through 2038.

GSWC's estimated future minimum payments under these purchased water supply commitments at December 31, 2016 are as follows (in thousands):

2017	\$	409
2018		409
2019		409
2020		409
2021		409
Thereafter		3,225
Total	\$	5,270

Bear Valley Electric Service:

Generally, GSWC's electric division purchases power at a fixed cost, under long-term purchased power contracts, depending on the amount of power and the period during which the power is purchased under such contracts. During 2014, GSWC's power purchases were based on month-to-month arrangements, as the previous long-term purchase power contract expired in 2013. However, GSWC began taking power pursuant to new purchased power contracts approved by the CPUC effective January 1, 2015 at a fixed cost over three and five year terms depending on the amount of power and period during which the power is purchased under the contracts. As of December 31, 2016, GSWC's commitment under these contracts totaled approximately \$18.1 million.

Operating Leases:

Registrant leases equipment and facilities primarily for its Regional and District offices and ASUS operations under non-cancelable operating leases with varying terms, provisions and expiration dates. Rent expense for leases that contain scheduled rent increases are recorded on a straight-line basis. During 2016, 2015 and 2014, Registrant's consolidated rent expense was approximately \$2,298,000, \$2,740,000 and \$2,982,000, respectively. Registrant's future minimum payments under long-term non-cancelable operating leases at December 31, 2016 are as follows (in thousands):

2017	\$	2,451
2018		2,106
2019		1,680
2020		1,347
2021		341
Thereafter		720
Total	\$	<u>8,645</u>

There is no material difference between the consolidated operations of AWR and the operations of GSWC in regards to the future minimum payments under long-term non-cancelable operating leases.

Note 14 - Contingencies

Condemnation of Properties:

The laws of the state of California provide for the acquisition of public utility property by governmental agencies through their power of eminent domain, also known as condemnation, where doing so is necessary and in the public interest. In addition, these laws provide that the owner of utility property (i) may contest whether the condemnation is actually necessary and in the public interest, and (ii) is entitled to receive the fair market value of its property if the property is ultimately taken.

Claremont System:

In December 2014, the City of Claremont, California filed a complaint in eminent domain against GSWC. The trial determining the City of Claremont's right to seize the system by eminent domain concluded in August 2016. On December 9, 2016, the County of Los Angeles Superior Court issued a decision rejecting the City of Claremont's attempt to take over GSWC's Claremont water system. On February 2, 2017, the City of Claremont filed an appeal to the decision. At this time, Registrant is unable predict the outcome of the appeal.

Ojai System:

In March 2013, Casitas Municipal Water District ("CMWD") passed resolutions under the Mello-Roos Communities Facilities District Act of 1982 ("Mello-Roos Act") authorizing the establishment of a Community Facilities District, and the issuance of bonds to finance the potential acquisition of GSWC's Ojai, California system through eminent domain. In January 2014, a group of citizens referred to as "Friends of Locally Owned Water" ("FLOW") were granted class status to allow them to later file a complaint against GSWC for damages related to any potential delay in the eminent domain proceedings caused by GSWC's challenge of CMWD's use of Mello-Roos funds for such a taking of property.

On May 12, 2016, CMWD filed a complaint in eminent domain against GSWC. The complaint also included additional causes of action related to claims of potential damages resulting from any delay caused by GSWC seeking relief in the prior action regarding the use of Mello-Roos funds for such a taking of property. On June 28, 2016, FLOW filed for intervention as a plaintiff to also seek potential damages resulting from the additional causes of actions listed above as facilitated in their earlier filing to be granted class status. On October 25, 2016, the Court struck FLOW's complaint in intervention and their claims for damages. At this time, management cannot predict whether FLOW will appeal the Court's ruling, and cannot predict the outcome of this eminent domain proceeding. The Ojai water system has a net book value of approximately \$22.5 million. GSWC serves approximately 3,000 customers in Ojai.

Environmental Clean-Up and Remediation:

GSWC has been involved in environmental remediation and cleanup at a plant site ("Chadron Plant") that contained an underground storage tank which was used to store gasoline for its vehicles. This tank was removed from the ground in July 1990 along with the dispenser and ancillary piping. Since then, GSWC has been involved in various remediation activities at this site. Analysis indicates that offsite monitoring wells may also be necessary to document effectiveness of remediation.

As of December 31, 2016, the total spent to clean-up and remediate GSWC's plant facility was approximately \$5.2 million, of which \$1.5 million has been paid by the State of California Underground Storage Tank Fund. Amounts paid by GSWC have been included in rate base and approved by the CPUC for recovery. As of December 31, 2016, GSWC has a regulatory asset and an accrued liability for the estimated additional cost of \$1.4 million to complete the cleanup at the site. The estimate includes costs for two years of continued activities of groundwater cleanup and monitoring, future soil treatment and site-closure-related activities. The ultimate cost may vary as there are many unknowns in remediation of underground gasoline spills and this is an estimate based on currently available information. Management also believes it is probable that the estimated additional costs will be approved in rate base by the CPUC.

Other Litigation:

Registrant is also subject to other ordinary routine litigation incidental to its business. Management believes that rate recovery, proper insurance coverage and reserves are in place to insure against property, general liability and workers' compensation claims incurred in the ordinary course of business. Registrant is unable to predict an estimate of the loss, if any, resulting from any pending suits or administrative proceedings.

Note 15 - Business Segments

AWR has 3 reportable segments, water, electric and contracted services, whereas GSWC has 2 segments, water and electric. AWR has no material assets other than its investments in its subsidiaries on a stand-alone basis.

All activities of GSWC, a rate-regulated utility, are geographically located within California. Activities of ASUS and its subsidiaries are conducted in California, Florida, Georgia, Maryland, New Mexico, North Carolina, South Carolina, Texas and Virginia. Each of ASUS's wholly owned subsidiaries is regulated, if applicable, by the state in which the subsidiary primarily conducts water and/or wastewater operations. Fees charged for operations and maintenance and renewal and replacement services are based upon the terms of the contracts with the U.S. government which have been filed, as appropriate, with the commissions in the states in which ASUS's subsidiaries are incorporated.

The tables below set forth information relating to GSWC's operating segments, ASUS and its subsidiaries and other matters. Total assets by segment are not presented below, as certain of Registrant's assets are not tracked by segment. The utility plants are net of respective accumulated provisions for depreciation. Capital additions reflect capital expenditures paid in cash and exclude U.S. government-funded and third-party prime funded capital expenditures for ASUS and property installed by developers and conveyed to GSWC.

(dollars in thousands)	As Of And For The Year Ended December 31, 2016				
	GSWC		ASUS	AWR	Consolidated
	Water	Electric	Contracts	Parent	AWR
Operating revenues	\$ 302,931	\$ 35,771	\$ 97,385	\$ —	\$ 436,087
Operating income (loss)	87,911	7,908	18,916	(19)	114,716
Interest expense, net	19,696	1,337	68	134	21,235
Utility Plant	1,089,031	56,280	5,615	—	1,150,926
Depreciation and amortization expense (1)	35,777	2,027	1,046	—	38,850
Income tax expense/(benefit)	25,894	2,715	6,672	(546)	34,735
Capital additions	120,850	7,063	1,954	—	129,867

(dollars in thousands)	As Of And For The Year Ended December 31, 2015				
	GSWC		ASUS	AWR	Consolidated
	Water	Electric	Contracts	Parent	AWR
Operating revenues	\$ 328,511	\$ 36,039	\$ 94,091	\$ —	\$ 458,641
Operating income (loss)	94,213	6,196	18,091	(11)	118,489
Interest expense, net	19,468	1,090	26	46	20,630
Utility Plant	1,005,114	51,002	4,678	—	1,060,794
Depreciation and amortization expense (1)	39,190	1,703	1,140	—	42,033
Income tax expense/(benefit)	30,302	2,170	6,069	(810)	37,731
Capital additions	77,440	8,704	1,179	—	87,323

(dollars in thousands)	As Of And For The Year Ended December 31, 2014				
	GSWC		ASUS	AWR	Consolidated
	Water	Electric	Contracts	Parent	AWR
Operating revenues	\$ 326,672	\$ 34,387	\$ 104,732	\$ —	\$ 465,791
Operating income (loss)	94,014	5,728	19,351	(48)	119,045
Interest expense, net	19,370	1,260	142	(82)	20,690
Utility Plant	953,678	45,202	4,640	—	1,003,520
Depreciation and amortization expense (1)	38,388	1,466	1,219	—	41,073
Income tax expense/(benefit)	30,410	1,596	7,038	(996)	38,048
Capital additions	66,304	4,584	1,665	—	72,553

(1) Depreciation computed on GSWC's transportation equipment is recorded in other operating expenses and totaled \$259,000, \$641,000 and \$678,000 for the years ended December 31, 2016, 2015 and 2014, respectively.

The following table reconciles total utility plant (a key figure for rate-making) to total consolidated assets (in thousands):

	December 31,	
	2016	2015
Total utility plant	\$ 1,150,926	\$ 1,060,794
Other assets	319,567	283,165
Total consolidated assets	<u>\$ 1,470,493</u>	<u>\$ 1,343,959</u>

Note 16 — Allowance for Doubtful Accounts

The table below presents Registrant’s provision for doubtful accounts charged to expense and accounts written off, net of recoveries. Provisions included in 2016 and 2015 for AWR and GSWC are as follows:

(dollars in thousands)	AWR	
	December 31,	
	2016	2015
Balance at beginning of year	\$ 944	\$ 892
Provision charged to expense	619	870
Accounts written off, net of recoveries	(799)	(818)
Balance at end of year	<u>\$ 764</u>	<u>\$ 944</u>
Allowance for doubtful accounts related to accounts receivable-customer	\$ 702	\$ 790
Allowance for doubtful accounts related to other accounts receivable	62	154
Total allowance for doubtful accounts	<u>\$ 764</u>	<u>\$ 944</u>
	GSWC	
	December 31,	
	2016	2015
Balance at beginning of year	\$ 919	\$ 892
Provision charged to expense	627	845
Accounts written off, net of recoveries	(785)	(818)
Balance at end of year	<u>\$ 761</u>	<u>\$ 919</u>
Allowance for doubtful accounts related to accounts receivable-customer	\$ 702	\$ 790
Allowance for doubtful accounts related to other accounts receivable	59	129
Total allowance for doubtful accounts	<u>\$ 761</u>	<u>\$ 919</u>

Note 17 — Supplemental Cash Flow Information

The following table sets forth non-cash financing and investing activities and other cash flow information (in thousands).

	AWR			GSWC		
	December 31,			December 31,		
	2016	2015	2014	2016	2015	2014
Taxes and Interest Paid:						
Income taxes paid	\$ 10,916	\$ 14,817	\$ 15,984	\$ 8,437	\$ 1,541	\$ 16,500
Interest paid, net of capitalized interest	22,305	21,822	22,236	22,078	21,797	22,184
Non-Cash Transactions:						
Accrued payables for investment in utility plant	\$ 17,236	\$ 20,655	\$ 13,147	\$ 17,207	\$ 20,655	\$ 13,141
Property installed by developers and conveyed	5,395	3,284	800	5,395	3,284	800

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of
American States Water Company

In our opinion, the consolidated financial statements listed in the accompanying index present fairly, in all material respects, the financial position of American States Water Company and its subsidiaries (“the Company”) at December 31, 2016 and December 31, 2015, and the results of their operations and their cash flows for each of the three years in the period ended December 31, 2016 in conformity with accounting principles generally accepted in the United States of America. In addition, in our opinion, the financial statement schedule listed in Item 15(a)(2) presents fairly, in all material respects, the information set forth therein when read in conjunction with the related consolidated financial statements. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2016, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). The Company's management is responsible for these financial statements and financial statement schedule, for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Report on Internal Control over Financial Reporting under Item 9A. Our responsibility is to express opinions on these financial statements, on the financial statement schedule, and on the Company's internal control over financial reporting based on our integrated audits. We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement and whether effective internal control over financial reporting was maintained in all material respects. Our audits of the financial statements included examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ PricewaterhouseCoopers LLP
Los Angeles, California
February 23, 2017

Report of Independent Registered Public Accounting Firm

To the Board of Directors and
Shareholder of Golden State Water Company

In our opinion, the financial statements listed in the accompanying index present fairly, in all material respects, the financial position of Golden State Water Company (the "Company") at December 31, 2016 and December 31, 2015, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2016 in conformity with accounting principles generally accepted in the United States of America. These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits of these statements in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

/s/ PricewaterhouseCoopers LLP
Los Angeles, California
February 23, 2017

Report from Management on the Responsibility for Financial Statements

The consolidated financial statements contained in the annual report were prepared by the management of American States Water Company, which is responsible for their integrity and objectivity. The consolidated financial statements were prepared in accordance with accounting principles generally accepted in the United States of America and include, where necessary, amounts based upon management's best estimates and judgments. All other financial information in the annual report is consistent with the consolidated financial statements and is also the responsibility of management.

The Audit Committee, composed of three outside directors, exercises oversight of management's discharge of its responsibilities regarding the systems of internal control and financial reporting. The committee periodically meets with management, the internal auditor and the independent accountants to review the work and findings of each. The committee also reviews the qualifications of, and recommends to the board of directors, a firm of independent registered public accountants.

Registrant's independent registered public accounting firm, PricewaterhouseCoopers LLP, is engaged to audit the consolidated financial statements included in this report in accordance with the standards of the Public Company Accounting Oversight Board (United States) and to express an opinion on whether those consolidated financial statements fairly present, in all material respects, Registrant's results of operations, financial position and cash flows. In addition, the effectiveness of AWR's internal control over financial reporting as of December 31, 2016 has been audited by PricewaterhouseCoopers LLP. The result of their work is expressed in their Report of Independent Registered Public Accounting Firm.

/s/ ROBERT J. SPROWLS
Robert J. Sprowls
President and Chief Executive Officer

/s/ EVA G. TANG
Eva G. Tang
Chief Financial Officer,
Senior Vice President - Finance,
Treasurer and Corporate Secretary

February 23, 2017

Selected Quarterly Financial Data (Unaudited)

The quarterly financial information presented below is unaudited. The business of Registrant is of a seasonal nature and it is management's opinion that comparisons of earnings for the quarterly periods do not reflect overall trends and changes in Registrant's operations.

(in thousands, except per share amounts)	AWR				
	For The Year Ended December 31, 2016				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter (1)	Year
Operating revenues	\$ 93,527	\$ 111,954	\$ 123,806	\$ 106,800	\$ 436,087
Operating income	21,233	31,774	39,617	22,092	114,716
Net income	10,150	16,742	21,639	11,212	59,743
Basic earnings per share	0.28	0.46	0.59	0.30	1.63
Diluted earnings per share	0.28	0.45	0.59	0.30	1.62

(in thousands)	GSWC				
	For The Year Ended December 31, 2016				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter (1)	Year
Operating revenues	\$ 76,885	\$ 88,759	\$ 98,763	\$ 74,295	\$ 338,702
Operating income	19,643	27,557	34,142	14,477	95,819
Net income	8,984	13,670	17,883	6,432	46,969

(1) As a result of the CPUC's decision issued in GSWC's water general rate case in December 2016, which was retroactive to January 1, 2016, the fourth quarter of 2016 reflects the retroactive impact of the new water rates related to GSWC's first nine months of 2016. The retroactive adjustment was due to a decrease of approximately \$5.2 million in the adopted water gross margin for the nine months ended September 30, 2016, resulting from the December decision, as compared to the recorded margin through September 30, 2016. In addition, the fourth quarter of 2016 reflects the recording by ASUS of retroactive operating revenues totaling \$1.7 million related to the period ended September 30, 2016 as a result of the U.S. government's concurrence with ASUS's price redetermination for one of its contracts.

(in thousands, except per share amounts)	AWR				
	For The Year Ended December 31, 2015				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
Operating revenues	\$ 100,933	\$ 114,618	\$ 132,975	\$ 110,115	\$ 458,641
Operating income	24,890	30,530	41,185	21,884	118,489
Net income	12,149	15,648	21,079	11,608	60,484
Basic earnings per share	0.32	0.41	0.57	0.31	1.61
Diluted earnings per share	0.32	0.41	0.56	0.31	1.60

(in thousands)	GSWC				
	For The Year Ended December 31, 2015				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
Operating revenues	\$ 82,473	\$ 95,470	\$ 105,219	\$ 81,388	\$ 364,550
Operating income	22,473	27,235	34,081	16,620	100,409
Net income	10,385	12,949	16,243	8,014	47,591

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

(a) Conclusion Regarding the Effectiveness of Disclosure Controls and Procedures

Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we conducted an evaluation of our disclosure controls and procedures, as such term is defined under Rule 13a-15(e) or 15d-15(e) promulgated under the Securities Exchange Act of 1934, as amended (the “Exchange Act”). Based on this evaluation, our principal executive officer and our principal financial officer concluded that the disclosure controls and procedures of AWR and GSWC were effective as of the end of the period covered by this annual report.

(b) Management’s Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of our management, including our principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on our evaluation under the framework in *Internal Control - Integrated Framework*, our management concluded that the internal control over financial reporting of AWR and GSWC was effective as of December 31, 2016.

(c) Attestation Report of the Independent Registered Public Accounting Firm

The effectiveness of our internal control over financial reporting of AWR as of December 31, 2016 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which is included herein.

(d) Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting (as such term is defined in Rules 13a-15(f) or 15d(f) under the Exchange Act) of AWR and GSWC that occurred during the fourth quarter of 2016 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information

None.

PART III**Item 10. Directors, Executive Officers and Corporate Governance**

Information responsive to Part III, Item 10 is included in the Proxy Statement, to be filed by AWR with the SEC pursuant to Regulation 14A, under the captions therein entitled: (i) “Proposal 1: Election of Directors”; (ii) “Executive Officers”; (iii) “Governance of the Company”; (iv) “Stock Ownership”; (v) “Nominating and Governance Committee”; (vi) “Audit and Finance Committee;” and (vii) “Obtaining Additional Information From Us” and is incorporated herein by reference pursuant to General Instruction G(3).

Item 11. Executive Compensation

Information responsive to Part III, Item 11 is included in the Proxy Statement, to be filed by AWR with the SEC pursuant to Regulation 14A, under the captions therein entitled: (i) “Proposal 1: Election of Directors”; (ii) “Executive Officers;” and (iii) “Compensation Committee” and is incorporated herein by reference pursuant to General Instruction G(3).

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

Information responsive to Part III, Item 12 is included in the Proxy Statement, to be filed by AWR with the SEC pursuant to Regulation 14A, under the caption entitled “Stock Ownership” and is incorporated herein by reference pursuant to General Instruction G(3).

Securities Authorized for Issuance under Equity Compensation Plans

AWR has made stock awards to its executive officers and managers under the 2000, 2008 and 2016 employee plans. It has also made stock awards to its non-employee directors under the 2003 and 2013 director plans. Information regarding the securities which have been issued and which are available for issuance under these plans is set forth in the table below as of December 31, 2016. This table does not include any Common Shares that may be issued under our 401(k) plan.

Plan Category	Number of securities to be issued upon exercise of outstanding options, warrants and rights⁽¹⁾	Weighted-average exercise price of outstanding options, warrants and rights⁽²⁾	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in the first column)⁽³⁾
Equity compensation plans approved by shareholders	345,143	\$17.27	2,261,053
Equity compensation plans not approved by shareholders	0	0	0
Total	345,143	\$17.27	2,261,053

- (1) Amount shown in this column consists of 136,560 options outstanding under the 2000 employee plan and the 2008 employee plan, 52,205 time-vested restricted stock units outstanding under the 2008 employee plan (including dividend equivalents thereon with respect to declared dividends), and 248 time-vested restricted stock units outstanding under the 2016 employee plan (including dividend equivalents thereon with respect to declared dividends), 100,854 performance awards at the maximum level (including dividend equivalents thereon with respect to declared dividends) outstanding under the 2008 employee plan and 55,276 restricted stock units (including dividend equivalents thereon with respect to declared dividends) outstanding under the 2003 directors plan.
- (2) Amount shown in this column is for options granted only.
- (3) Amount shown in this column consists of 197,069 shares available under the 2003 directors plan, 148,441 shares available under the 2013 directors plan, 416,152 shares available under the 2008 employee plan, and 1,499,391 shares available under the 2016 employee plan. The only shares that may be issued under the 2003 directors plan are pursuant to dividend equivalent rights on dividends not yet declared with respect to restricted stock units granted under the 2003 directors plan. The only shares that maybe issued under the 2008 employee plan are pursuant to dividend equivalent rights on dividends not yet declared with respect to restricted stock units and performance awards granted under the 2008 employee plan. No additional stock awards may be granted under the 2000 employee plan, the 2003 directors plan or the 2008 employee plan.

Item 13. Certain Relationships and Related Transactions, and Director Independence

Information responsive to Part III, Item 13 is included in the Proxy Statement, to be filed by AWR with the SEC pursuant to Regulation 14A, under the caption therein entitled “Governance of the Company” and is incorporated herein by reference pursuant to General Instruction G(3).

Item 14. Principal Accounting Fees and Services

Information responsive to Part III, Item 14 is included in the Proxy Statement, to be filed by AWR with the SEC pursuant to Regulation 14A, under the caption therein entitled “Proposal 4: Ratification of Auditors” and is incorporated herein by reference pursuant to General Instruction G(3).

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) The following documents are filed as a part of this Annual Report on Form 10-K:

1. Reference is made to the Financial Statements incorporated herein by reference to Part II, Item 8 hereof.
2. Schedule I— Condensed Financial Information of AWR. Schedules II, III, IV, and V are omitted as they are not applicable.
3. Reference is made to Item 15(b) of this Annual Report on Form 10-K.

(b) Exhibits:

- 3.1 By-Laws of American States Water Company incorporated by reference to Exhibit 3.1 of Registrant's Form 10-Q, filed August 6, 2012 (File No. 1-4431)
- 3.2 By-laws of Golden State Water Company incorporated by reference to Exhibit 3.1 of Registrant's Form 8-K filed May 13, 2011
- 3.3 Amended and Restated Articles of Incorporation of American States Water Company incorporated by reference to Exhibit 3.1 of Registrant's Form 8-K filed June 19, 2013
- 3.4 Restated Articles of Incorporation of Golden State Water Company, as amended, incorporated herein by reference to Exhibit 3.1 of Registrant's Form 10-Q for the quarter ended September 30, 2005 (File No. 1-14431)
- 4.1 Indenture, dated September 1, 1993 between Golden State Water Company and The Bank of New York Mellon Trust Company, N.A., as successor trustee, as supplemented, incorporated herein by reference to Exhibit 4.01 of Golden State Water Company Form S-3 filed December 12, 2008
- 4.2 Note Purchase Agreement dated as of October 11, 2005 between Golden State Water Company and Co-Bank, ACB incorporated by reference to Exhibit 4.1 of Registrant's Form 8-K filed October 13, 2005 (File No. 1-14431)
- 4.3 Note Purchase Agreement dated as of March 10, 2009 between Golden State Water Company and Co-Bank, ACB, incorporated herein by reference to Exhibit 10.16 to Registrant's Form 10-K filed on March 13, 2009 (File No. 1-14431)
- 4.4 Indenture dated as of December 1, 1998 between American States Water Company and The Bank of New York Mellon Trust Company, N.A., as supplemented by the First Supplemental Indenture dated as of July 31, 2009 incorporated herein by reference to Exhibit 4.1 of American States Water Company's Form 10-Q for the quarter ended June 30, 2009 (File No. 1-14431)
- 10.1 Second Sublease dated October 5, 1984 between Golden State Water Company and Three Valleys Municipal Water District incorporated herein by reference to Registrant's Registration Statement on Form S-2, Registration No. 33-5151
- 10.2 Note Agreement dated as of May 15, 1991 between Golden State Water Company and Transamerica Occidental Life Insurance Company incorporated herein by reference to Registrant's Form 10-Q with respect to the quarter ended June 30, 1991 (File No. 1-14431)
- 10.3 Schedule of omitted Note Agreements, dated May 15, 1991, between Golden State Water Company and Transamerica Annuity Life Insurance Company, and Golden State Water Company and First Colony Life Insurance Company incorporated herein by reference to Registrant's Form 10-Q with respect to the quarter ended June 30, 1991 (File No. 1-14431)
- 10.4 Loan Agreement between California Pollution Control Financing Authority and Golden State Water Company, dated as of December 1, 1996 incorporated by reference to Exhibit 10.7 of Registrant's Form 10-K for the year ended December 31, 1998 (File No. 1-14431)
- 10.5 Agreement for Financing Capital Improvement dated as of June 2, 1992 between Golden State Water Company and Three Valleys Municipal Water District incorporated herein by reference to Registrant's Form 10-K with respect to the year ended December 31, 1992 (File No. 1-14431)

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- 10.6 Water Supply Agreement dated as of June 1, 1994 between Golden State Water Company and Central Coast Water Authority incorporated herein by reference to Exhibit 10.15 of Registrant's Form 10-K with respect to the year ended December 31, 1994 (File No. 1-14431)
- 10.7 2003 Non-Employee Directors Stock Purchase Plan, as amended, incorporated herein by reference to Exhibit 10.1 to Registrant's Form 8-K filed on January 30, 2009 (2)
- 10.8 Dividend Reinvestment and Common Share Purchase Plan incorporated herein by reference to American States Water Company Registrant's Form S-3D filed November 12, 2008
- 10.9 Form of Amended and Restated Change in Control Agreement between American States Water Company or a subsidiary and certain executives incorporated herein by reference to Exhibit 10.4 to Registrant's Form 8-K filed on November 21, 2014 (2)
- 10.10 Golden State Water Company Pension Restoration Plan, as amended, incorporated herein by reference to Exhibit 10.1 to the Registrant's Form 8-K filed on May 21, 2009 (File No. 1-14431) (2)
- 10.11 American States Water Company 2000 Stock Incentive Plan, as amended, incorporated by reference to Exhibit 10.2 of Registrant's Form 8-K filed May 20, 2015 (File No. 1-14431) (2)
- 10.12 Amended and Restated Credit Agreement between American States Water Company dated June 3, 2005 with Wells Fargo Bank, N.A., as Administrative Agent, as amended, incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed October 28, 2016
- 10.13 Form of Indemnification Agreement for executive officers incorporated by reference to Exhibit 10.21 to Registrant's Form 10-K for the year ended December 31, 2006 (File No. 1-14431) (2)
- 10.14 Form of Non-Qualified Stock Option Plan Agreement for officers and key employees for the 2000 Stock Incentive Plan incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed on January 7, 2005 (File No. 1-14431) (2)
- 10.15 Form of Non-Qualified Stock Option Plan Agreement for officers and key employees for the 2000 Stock Incentive Plan incorporated by reference to Exhibit 10.1 of Registrant's Form 10-Q for the period ended March 31, 2006 (File No. 1-14431) (2)
- 10.16 Form of Director's Non-Qualified Stock Option Agreement incorporated by reference to Exhibit 10.1 to Registrant's Form 10-Q for the period ended September 30, 2006 (File No. 1-14431) (2)
- 10.17 Form of Restricted Stock Unit Award Agreement for officers and key employees under the 2008 Stock Incentive Plan for restricted stock unit awards prior to January 1, 2011 but before January 1, 2015 incorporated by reference to Exhibit 10.4 of Registrant's Form 8-K filed on November 5, 2008 (File No. 1-14431) (2)
- 10.18 2008 Stock Incentive Plan, as amended, incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed March 25, 2016 (2)
- 10.19 Form of Nonqualified Stock Option Agreement for officers and key employees for the 2008 Stock Incentive Plan incorporated herein by reference to Exhibit 10.3 to Registrant's Form 8-K filed November 21, 2014 (2)
- 10.20 Policy Regarding the Recoupment of Certain Performance-Based Compensation Payments incorporated herein by reference to Exhibit 10.3 to the Registrant's Form 8-K filed on April 2, 2014 (2)
- 10.21 Performance Incentive Plan incorporated herein by reference to Exhibit 10.4 to the Registrant's Form 8-K filed on May 21, 2015 (File No. 1-14431) (2)
- 10.22 Officer Relocation Policy incorporated herein by reference to Exhibit 10.5 to the Registrant's Form 8-K filed on July 31, 2009 (File No. 1-14431) (2)
- 10.23 Form of Non-Qualified Stock Option Award Agreement for officers and key employees under the 2008 Stock Incentive Plan for stock options granted after December 31, 2010 but prior to January 1, 2015 incorporated by reference to Exhibit 10.2 of Registrant's Form 8-K filed on February 4, 2011 (2)
- 10.24 Form of Restricted Stock Unit Award Agreement for officers and key employees under the 2016 Stock Incentive Plan incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed on February 3, 2017 (File No. 1-14431) (2)
- 10.25 Form of Indemnification Agreement for directors incorporated by reference to Exhibit 10.35 to Registrant's Form 10-K for the period ended December 31, 2012 (1)(2)
- 10.26 2016 Short-Term Incentive Program incorporated by reference herein to Exhibit 10.3 to Registrant's Form 8-K filed on March 25, 2016 (2)

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10.27	Form of 2016 Short-Term Incentive Award Agreement incorporated by reference to Exhibit 10.4 to the Registrant's Form 8-K filed March 25, 2016 (2)
10.28	2016 Stock Incentive Plan incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed on May 19, 2016 (2)
10.29	Form of 2014 Performance Award Agreement incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed January 1, 2014 (2)
10.30	2013 Non-Employee Directors Plan incorporated by reference to Exhibit 10.2 to Registrant's Form 8-K filed March 25, 2016 (2)
10.31	2014 Short-Term Incentive Program incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed on April 2, 2014 (2)
10.32	Form of 2014 Short-Term Incentive Agreement incorporated by reference to Exhibit 10.2 to Registrant's Form 8-K filed on April 2, 2014 (2)
10.33	Form of Restricted Stock Unit Agreement for grants after December 31, 2014 incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed November 21, 2014 (2)
10.34	Form of 2015 Performance Award Agreement incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed January 30, 2015 (2)
10.35	Form of 2016 Performance Award Agreement incorporated by reference to Exhibit 10.1 to Registrant's Form 8-K filed January 29, 2016 (2)
10.36	Form of 2017 Performance Award Agreement incorporated by reference to Exhibit 10.2 to Registrant's Form 8-K filed February 3, 2017 (2)
21	Subsidiaries of Registrant (1)
23.1	Consent of Independent Registered Public Accounting Firm for AWR (1)
23.1.1	Consent of Independent Registered Public Accounting Firm for GSWC (1)
31.1	Certification of Chief Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for AWR (1)
31.1.1	Certification of Chief Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for GSWC (1)
31.2	Certification of Chief Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for AWR (1)
31.2.1	Certification of Chief Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for GSWC (1)
32.1	Certification of Chief Executive Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (3)
32.2	Certification of Chief Financial Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (3)
101.INS	XBRL Instance Document (3)
101.SCH	XBRL Taxonomy Extension Schema (3)
101.CAL	XBRL Taxonomy Extension Calculation Linkbase (3)
101.DEF	XBRL Taxonomy Extension Definition Linkbase (3)
101.LAB	XBRL Taxonomy Extension Label Linkbase (3)
101.PRE	XBRL Taxonomy Extension Presentation Linkbase (3)

(c) See Item 15(a)(2)

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- | | |
|-----|---|
| (1) | Filed concurrently herewith |
| (2) | Management contract or compensatory arrangement |
| (3) | Furnished concurrently herewith |

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, Registrants have duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

AMERICAN STATES WATER COMPANY (“AWR”):

By: /s/ EVA G. TANG

Eva G. Tang
Senior Vice President-Finance, Chief Financial
Officer, Treasurer and Corporate Secretary

GOLDEN STATE WATER COMPANY (“GSWC”):

By: /s/ EVA G. TANG

Eva G. Tang
Senior Vice President-Finance, Chief Financial
Officer and Secretary

Date: February 23, 2017

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of Registrants and in the capacities and on the dates indicated.

	Date:
<u>/s/ LLOYDE E. ROSS</u> Lloyd E. Ross Chairman of the Board and Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ ROBERT J. SPROWLS</u> Robert J. Sprowls Principal Executive Officer, President and Chief Executive Officer of AWR and GSWC and Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ EVA G. TANG</u> Eva G. Tang Principal Financial and Accounting Officer, Senior Vice President-Finance, Chief Financial Officer, Treasurer and Corporate Secretary of AWR; and Principal Financial and Accounting Officer, Senior Vice President-Finance, Chief Financial Officer and Secretary of GSWC	<u>February 23, 2017</u>
<u>/s/ JAMES L. ANDERSON</u> James L. Anderson Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/SARAH. J. ANDERSON</u> Sarah. J. Anderson Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ DIANA M. BONTÁ</u> Diana M. Bontá Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ JOHN R. FIELDER</u> John R. Fielder Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ ANNE M. HOLLOWAY</u> Anne M. Holloway Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ JAMES F. MCNULTY</u> James F. McNulty Director of AWR and GSWC	<u>February 23, 2017</u>
<u>/s/ JANICE F. WILKINS</u> Janice F. Wilkins Director of AWR and GSWC	<u>February 23, 2017</u>

AMERICAN STATES WATER COMPANY
SCHEDULE I - CONDENSED FINANCIAL INFORMATION OF PARENT

CONDENSED BALANCE SHEETS

(in thousands)	December 31,	
	2016	2015
Assets		
Cash and equivalents	\$ 32	\$ 836
Inter-company note receivables	76,931	12,000
Income taxes receivable and other receivables	—	11
Total current assets	76,963	12,847
Investments in subsidiaries	506,584	479,397
Deferred taxes and other assets	6,964	5,604
Total assets	\$ 590,511	\$ 497,848
Liabilities and Capitalization		
Notes payable to bank	\$ 90,000	\$ 28,000
Income taxes payable	4,043	2,579
Inter-company payables	—	474
Deferred taxes and other liabilities	517	28
Total current liabilities	94,560	31,081
Deferred taxes	—	734
Income taxes payable and other liabilities	1,654	88
Total other liabilities	1,654	822
Common shareholders' equity	494,297	465,945
Total capitalization	494,297	465,945
Total liabilities and capitalization	\$ 590,511	\$ 497,848

The accompanying condensed notes are an integral part of these condensed financial statements.

AMERICAN STATES WATER COMPANY
SCHEDULE I - CONDENSED FINANCIAL INFORMATION OF PARENT

CONDENSED STATEMENTS OF INCOME

(In thousands, except per share amounts)	For the Years Ended December 31,		
	2016	2015	2014
Operating revenues and other income	\$ 71	\$ 98	\$ 81
Operating expenses and other expenses	19	11	48
Income before equity in earnings of subsidiaries and income taxes	52	87	33
Equity in earnings of subsidiaries	59,145	59,587	60,029
Income before income taxes	59,197	59,674	60,062
Income tax expense (benefit)	(546)	(810)	(996)
Net income	\$ 59,743	\$ 60,484	\$ 61,058
Weighted Average Number of Common Shares Outstanding	36,552	37,389	38,658
Basic Earnings Per Common Share	\$ 1.63	\$ 1.61	\$ 1.57
Weighted Average Number of Diluted Common Shares Outstanding	36,750	37,614	38,880
Fully Diluted Earnings per Common Share	\$ 1.62	\$ 1.60	\$ 1.57
Dividends Paid Per Common Share	\$ 0.914	\$ 0.874	\$ 0.831

The accompanying condensed notes are an integral part of these condensed financial statements.

AMERICAN STATES WATER COMPANY
SCHEDULE I - CONDENSED FINANCIAL INFORMATION OF PARENT

CONDENSED STATEMENTS OF CASH FLOWS

(in thousands)	For the Years Ended December 31,		
	2016	2015	2014
Cash Flows From Operating Activities	\$ 34,878	\$ 57,682	\$ 61,092
Cash Flows From Investing Activities:			
Loans (made to)/repaid from, wholly-owned subsidiaries	(64,500)	(12,000)	19,668
Net cash provided (used) in investing activities	(64,500)	(12,000)	19,668
Cash Flows From Financing Activities:			
Repurchase of Common Shares	—	(72,893)	(17,180)
Proceeds from note payable to GSWC	—	20,700	8,300
Repayment of note payable to GSWC	—	(20,700)	(8,800)
Proceeds from stock option exercises	235	1,198	589
Net change in notes payable to banks	62,000	28,000	—
Dividends paid	(33,408)	(32,690)	(32,111)
Other	(9)	(90)	(36)
Net cash provided (used) in financing activities	28,818	(76,475)	(49,238)
Change in cash and equivalents	(804)	(30,793)	31,522
Cash and equivalents at beginning of period	836	31,629	107
Cash and equivalents at the end of period	\$ 32	\$ 836	\$ 31,629

The accompanying condensed notes are an integral part of these condensed financial statements.

**AMERICAN STATES WATER COMPANY
NOTES TO CONDENSED FINANCIAL INFORMATION OF PARENT**

Note 1 — Basis of Presentation

The accompanying condensed financial statements of AWR (parent) should be read in conjunction with the consolidated financial statements and notes thereto of American States Water Company and subsidiaries ("Registrant") included in Part II, Item 8 of this Form 10-K. AWR's (parent) significant accounting policies are consistent with those of Registrant and its wholly-owned subsidiaries, Golden State Water Company ("GSWC") and American States Utility Services, Inc. ("ASUS"), except that all subsidiaries are accounted for as equity method investments.

Related Party Transactions:

As further discussed in *Note 2 — Notes Payable to Banks*, AWR (parent) has access to a \$150.0 million syndicated credit facility. AWR (parent) borrows under this facility and provides funds to its subsidiaries, in support of their operations. Any amounts owed to AWR (parent) for borrowings under this facility are reflected as inter-company receivables on the condensed balance sheets. The interest rate charged to the subsidiaries is sufficient to cover AWR (parent)'s interest cost under the credit facility.

In October 2015, AWR issued interest bearing promissory notes (the "Notes") to GSWC and ASUS for \$40 million and \$10 million, respectively, which expire on May 23, 2018. Under the terms of the Notes, AWR may borrow from GSWC and ASUS amounts up to \$40 million and \$10 million, respectively, for working capital purposes. AWR agrees to pay any unpaid principal amounts outstanding under these notes, plus accrued interest. As of December 31, 2016 and 2015, there were no amounts outstanding under these notes.

AWR (parent) guarantees performance of ASUS's military privatization contracts and agrees to provide necessary resources, including financing, which are necessary to assure the complete and satisfactory performance of such contracts.

Note 2 — Note Payable to Banks

AWR (parent) has access to a syndicated credit facility, which expires in May 2018. In October 2016, AWR elected to increase the aggregate commitment as permitted under the terms of the facility agreement from \$100.0 million to \$150.0 million. The aggregate effective amount that may be outstanding under letters of credit is \$25.0 million. AWR has obtained letters of credit, primarily for GSWC, in the aggregate amount of \$9.9 million, with fees of 0.65% including: (i) a \$5.4 million letter of credit representing a percentage of the outstanding American Recovery and Reinvestment Act ("ARRA") funds received by GSWC for reimbursement of capital costs related to the installation of meters in GSWC's Arden-Cordova water system, (ii) letters of credit in an aggregate amount of \$340,000 as security for GSWC's business automobile insurance policy, (iii) a letter of credit in an amount of \$585,000 as security for the purchase of power, (iv) a \$15,000 irrevocable letter of credit pursuant to a franchise agreement with the City of Rancho Cordova, and (v) an irrevocable letter of credit in the amount of \$3.6 million, pursuant to a settlement agreement with Southern California Edison Company to cover GSWC's commitment to pay the settlement amount. Letters of credit outstanding reduce the amount that may be borrowed under the revolving credit facility. There were no compensating balances required.

Loans can be obtained at the option of AWR and bear interest at rates based on credit ratings and Euro rate margins. In April 2016, Standard & Poor's Rating Services ("S&P") affirmed the A+ credit rating and stable outlook on both AWR and GSWC. S&P's debt ratings range from AAA (highest rating possible) to D (obligation is in default). In December 2016, Moody's Investors Service ("Moody's") affirmed its A2 rating with a stable outlook for GSWC.

At December 31, 2016, there was \$90.0 million outstanding under this facility. At times, AWR (parent) borrows under this facility and provides loans to its subsidiaries in support of its operations, under terms that are similar to that of the credit facility.

AWR's (parent) short-term borrowing activities (excluding letters of credit) for the years ended December 31, 2016 and 2015 were as follows:

(in thousands, except percent)	December 31,	
	2016	2015
Balance Outstanding at December 31,	\$ 90,000	\$ 28,000
Interest Rate at December 31,	1.46%	1.09%
Average Amount Outstanding	\$ 59,261	\$ 4,112
Weighted Average Annual Interest Rate	1.20%	0.92%
Maximum Amount Outstanding	\$ 96,000	\$ 37,000

All of the letters of credit are issued pursuant to the syndicated revolving credit facility. The syndicated revolving credit facility contains restrictions on prepayments, disposition of property, mergers, liens and negative pledges, indebtedness and guaranty obligations, transactions with affiliates, minimum interest coverage requirements, a maximum debt to capitalization ratio and a minimum debt rating. Pursuant to the credit agreement, AWR must maintain a minimum interest coverage ratio of 3.25 times interest expense, a maximum total funded debt ratio of 0.65 to 1.00 and a minimum debt rating from Moody's or S&P of Baa3 or BBB-, respectively. As of December 31, 2016, AWR was in compliance with these covenants with an interest coverage ratio of 7.07 times interest expense, a debt ratio of 0.46 to 1.00 and a debt rating of A+.

Note 3 — Income Taxes

AWR (parent) receives a tax benefit for expenses incurred at the parent-company level. AWR (parent) also recognizes the effect of AWR's consolidated California unitary apportionment, which is beneficial or detrimental depending on a combination of the profitability of AWR's consolidated non-California activities as well as the proportion of its consolidated California sales to total sales.

Note 4 — Dividend from Subsidiaries

Dividends in the amount of \$33.8 million, \$62.0 million and \$52.0 million were paid to AWR (parent) by its wholly-owned subsidiaries during the years ended December 31, 2016, 2015 and 2014, respectively.

Subsidiaries of
American States Water Company

Golden State Water Company

American States Utility Services, Inc.

Fort Bliss Water Services Company

Old Dominion Utility Services, Inc.

Terrapin Utility Services, Inc.

Palmetto State Utility Services, Inc.

Old North Utility Services, Inc.

Emerald Coast Utility Services, Inc.

California Cities Water Company, Inc.

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-3D (No. 333-155310) and S-8 (Nos. 333-155376, 333-132496, 333-129873, 333-108095, 333-189508, and 333-213049) of American States Water Company of our report dated February 23, 2017 relating to the financial statements, financial statement schedule and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP
Los Angeles, California
February 23, 2017

Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for AWR

I, Robert J. Sprowls, certify that:

- 1) I have reviewed this annual report on Form 10-K of American States Water Company (referred to as “the Registrant”) for the year ended December 31, 2016;
- 2) Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
- 3) Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the Registrant as of, and for, the periods presented in this report;
- 4) The Registrant’s other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the Registrant and have:
 - a) designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the Registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) evaluated the effectiveness of the Registrant’s disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) disclosed in this report any change in the Registrant’s internal control over financial reporting that occurred during the Registrant’s most recent fiscal quarter (the Registrant’s fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the Registrant’s internal control over financial reporting.
- 5) The Registrant’s other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the Registrant’s auditors and the audit committee of Registrant’s board of directors (or persons performing the equivalent function):
 - a) all significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the Registrant’s ability to record, process, summarize and report financial information; and
 - b) any fraud, whether or not material, that involves management or other employees who have a significant role in the Registrant’s internal controls over financial reporting.

Dated: February 23, 2017

By: /s/ ROBERT J. SPROWLS
Robert J. Sprowls
President and Chief Executive Officer

Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for AWR

I, Eva G. Tang, certify that:

- 1) I have reviewed this annual report on Form 10-K of American States Water Company (referred to as “the Registrant”) for the year ended December 31, 2016;
- 2) Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
- 3) Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the Registrant as of, and for, the periods presented in this report;
- 4) The Registrant’s other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the Registrant and have:
 - a) designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the Registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) evaluated the effectiveness of the Registrant’s disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) disclosed in this report any change in the Registrant’s internal control over financial reporting that occurred during the Registrant’s most recent fiscal quarter (the Registrant’s fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the Registrant’s internal control over financial reporting.
- 5) The Registrant’s other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the Registrant’s auditors and the audit committee of Registrant’s board of directors (or persons performing the equivalent function):
 - a) all significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the Registrant’s ability to record, process, summarize and report financial information; and
 - b) any fraud, whether or not material, that involves management or other employees who have a significant role in the Registrant’s internal controls over financial reporting.

Dated: February 23, 2017

By: /s/ EVA G. TANG
Eva G. Tang
Senior Vice President-Finance, Chief Financial Officer, Treasurer
and Corporate Secretary

Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for GSWC

I, Robert J. Sprowls, certify that:

- 1) I have reviewed this annual report on Form 10-K of Golden State Water Company (referred to as "GSWC") for the year ended December 31, 2016;
- 2) Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
- 3) Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the GSWC as of, and for, the periods presented in this report;
- 4) GSWC's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for GSWC and have:
 - a) designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to GSWC, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) evaluated the effectiveness of GSWC's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) disclosed in this report any change in GSWC's internal control over financial reporting that occurred during GSWC's most recent fiscal quarter (GSWC's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, GSWC's internal control over financial reporting.
- 5) GSWC's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the GSWC's auditors and the audit committee of GSWC's board of directors (or persons performing the equivalent function):
 - a) all significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the GSWC's ability to record, process, summarize and report financial information; and
 - b) any fraud, whether or not material, that involves management or other employees who have a significant role in GSWC's internal controls over financial reporting.

Dated: February 23, 2017

By: /s/ ROBERT J. SPROWLS

Robert J. Sprowls
President and Chief Executive Officer

Certification pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 for GSWC

I, Eva G. Tang, certify that:

- 1) I have reviewed this annual report on Form 10-K of Golden State Water Company (referred to as "GSWC") for the year ended December 31, 2016;
- 2) Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
- 3) Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of GSWC as of, and for, the periods presented in this report;
- 4) GSWC's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for GSWC and have:
 - a) designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to GSWC, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - b) designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - c) evaluated the effectiveness of GSWC's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - d) disclosed in this report any change in GSWC's internal control over financial reporting that occurred during GSWC's most recent fiscal quarter (GSWC's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, GSWC's internal control over financial reporting.
- 5) GSWC's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to GSWC's auditors and the audit committee of GSWC's board of directors (or persons performing the equivalent function):
 - a) all significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect GSWC's ability to record, process, summarize and report financial information; and
 - b) any fraud, whether or not material, that involves management or other employees who have a significant role in GSWC's internal controls over financial reporting.

Dated: February 23, 2017

By: /s/ EVA G. TANG

Eva G. Tang
Senior Vice President-Finance, Chief Financial Officer and
Secretary

Certification pursuant to Section 906 of the Sarbanes-Oxley Act of 2002

In connection with the Annual Report of American States Water Company and Golden State Water Company (the "Registrant") on Form 10-K for the year ended December 31, 2016, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I Robert J. Sprowls, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that, to the best of my knowledge:

- (1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Registrant.

/s/ ROBERT J. SPROWLS

Robert J. Sprowls
President and Chief Executive Officer

Dated: February 23, 2017

Certification pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
(18 U.S.C. Section 1350)

In connection with the Annual Report of American States Water Company and Golden State Water Company (the "Registrant") on Form 10-K for the year ended December 31, 2016, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I Eva G. Tang, certify, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that, to the best of my knowledge:

- (1) The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Registrant.

/s/ EVA G. TANG

Eva G. Tang

Senior Vice President-Finance, Chief Financial Officer,
Treasurer and Corporate Secretary

Dated: February 23, 2017



Golden State
Water Company
A Subsidiary of American States Water Company

May 1, 2008

Advice Letter No. 1276-W

(U 133-W)

California Public Utilities Commission

Golden State Water Company ("GSWC") hereby transmits one original and three conformed copies of the following tariff sheets applicable to its Region I customer service areas:

<u>CPUC Sheet No.</u>	<u>Title of Sheet</u>	<u>Canceling CPUC Sheet No.</u>
Revised No. 5248-W	Arden Cordova District Arden System Tariff Area Map	Revised No. 4156-W
Revised No. 5249-W	Arden Cordova District Cordova System Tariff Area Map	Revised No. 4156-W
Revised No. 5250-W	Bay Point District Tariff Area Map	Revised No. 2963-W
Revised No. 5251-W	Clearlake District Tariff Area Map	Revised No. 3473-W
Revised No. 5252-W	Los Osos District Edna Road System Tariff Area Map	Revised No. 3564-W
Revised No. 5253-W	Los Osos District Los Osos System Tariff Area Map	Revised No. 4979-W
Revised No. 5254-W	Ojai District Ojai System Tariff Area Map	Revised No. 2741-W

Revised No. 5255-W	Santa Maria District Lake Marie System Tariff Area Map	Revised No. 4731-W
Revised No. 5256-W	Santa Maria District Orcutt System Tariff Area Map	Revised No. 4731-W
Revised No. 5257-W	Santa Maria District Sisquoc System Tariff Area Map	Revised No. 4731-W
Revised No. 5258-W	Santa Maria District Tanglewood System Tariff Area Map	Revised No. 4731-W
Revised No. 5259-W	Santa Maria District Nipomo System Tariff Area Map	Revised No. 3957-W
Revised No. 5260-W	Simi Valley District Tariff Area Map	Revised No. 4799-W
Revised No. 5261-W	Table of Contents Page 1 of 4	Revised No. 5247-W

Subject: Region I Service Area Maps

Purpose

The purpose of this filing is to implement the minor modifications to the Region I tariff maps pursuant to the directives contained Decision No. ("D") 08-01-043.

Background

This advice letter is in compliance with Section 7.23 of Decision No. ("D") 08-01-043, which authorizes GSWC to implement minor charges to its existing tariff maps in the Region I service areas. These changes will bring the Region I maps into conformance with the actual service areas served. D. 08-01-043 specifically states,

"Golden State Water requests minor modifications to its existing tariff maps. (Ex. GSW (ALL)-8.) These requests are reasonable and we authorize these changes."

GSWC filed a request for modifications of the Region I service area maps in its Application No. 07-01-009. The modifications were due to the conversion of the maps to

electronic format in an effort to update the system boundaries, where appropriate, to indicate the actual parcels of customers served rather than simply identifying the roadway and/or water main adjacent to the customers served.

The changes were made to clarify or "clean up" the tariff maps. The descriptions below identify specific changes made to the each tariff map within Region I.

Arden-Cordova Service Area: The previously approved map has been separated into two individual maps, more specifically one tariff map for the Arden System and one for the Rancho Cordova System.

- Arden System: Three parcels were added adjacent to the southerly boundary to more accurately indicate parcels served.
- Rancho Cordova System: The addition of the Villages of Zinfandel, located in the southerly portion of the service area.

Bay Point Service Area: The addition of the California Tradewinds/Skyline subdivisions and the Calvary Temple church site, located in the westerly region of the system near Driftwood Drive and Evora Road, and the Willow Estates subdivision, located on the easterly edge of the system.

Clearlake Service Area: The area added is based on the boundary delineation between GSWC and the adjacent water purveyor.

Los Osos Service Area: The previously approved map has been separated into two individual maps, more specifically one tariff map for the Los Osos System and one for the Edna Road System.

- Los Osos System: The Los Osos System has been extended to include the Monarch Grove subdivision, located in the western region of the system.
- Edna Road System: The area added is based on the boundary delineation between GSWC and the adjacent water purveyor.

Santa Maria Service Area: A separate map has been created for each of the five systems within this service area.

- Orcutt System: No additions to the Orcutt System were requested.
- Lake Marie System: The Lake Marie System has been extended to include multiple parcels that have been served since 1983, but were inadvertently left off the previously filed tariff map.
- Sisquoc System: The Sisquoc System has been extended to include the Dutra

Ranch property, located on the eastern edge of the system.

- Nipomo System: No additions to the Nipomo System were requested.
- Tanglewood System: No additions to the Tanglewood System were requested.

Simi Valley Service Area: No additions to the Simi Valley System were requested.

The filing of these maps will not increase or change, cause the withdrawal of service nor conflict with other schedules or rules.

TIER DESIGNATION

Pursuant to D. 07-01-024, this advice letter is submitted with a Tier 1 designation.

PROTEST AND RESPONSES

Anyone may respond to or protest this advice letter. A response supports the filing and may contain information that proves useful to the Commission in evaluating the advice letter. A protest objects to the advice letter in whole or in part and must set forth the specific grounds on which it is based. These grounds are:

- (1) The utility did not properly serve or give notice of the advice letter;
- (2) The relief requested in the advice letter would violate statute or Commission order, or is not authorized by statute or Commission order on which the utility relies;
- (3) The analysis, calculations, or data in the advice letter contain material error or omissions;
- (4) The relief requested in the advice letter is pending before the Commission in a formal proceeding; or
- (5) The relief requested in the advice letter requires consideration in a formal hearing, or is otherwise inappropriate for the advice letter process; or
- (6) The relief requested in the advice letter is unjust, unreasonable, or discriminatory (provided that such a protest may not be made where it would require re-litigating a prior order of the Commission.)

A protest shall provide citations or proofs where available to allow staff to properly consider the protest.

A response or protest must be made in writing or by electronic mail and must be received by the Water Division within 20 days of the date this advice letter is filed. The address for mailing or delivering a protest is:

Tariff Unit, Water Division, 3rd floor

May 1, 2008

California Public Utilities Commission,
505 Van Ness Avenue, San Francisco, CA 94102
E-mail: water_division@cpuc.ca.gov

On the same date the response or protest is submitted to the Water Division, the respondent or protestant shall send a copy by mail (or e-mail) to us, addressed to:

Golden State Water Company
ATTN: Ronald Moore
630 East Foothill Blvd.
San Dimas, CA 91773
Fax: 909-394-7427 or
E-mail: rkmoore@gswater.com

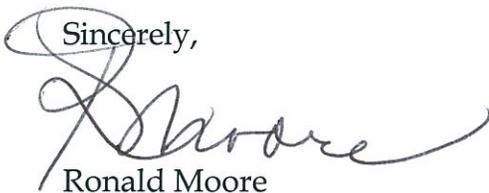
If you have not received a reply to your protest within 10 business days, contact this person at 909-394-3600 ext. 682.

Cities and counties that need Board of Supervisors or Board of Commissioners approval to protest should inform the Water Division, within the 20 day protest period, so that a late filed protest can be entertained. The informing document should include an estimate of the date the proposed protest might be voted on.

The actions requested in this advice letter are not now the subject of any formal filings with the California Public Utilities Commission, including a formal complaint, nor action in any court of law.

No individuals or utilities have requested notification of filing of tariffs. Distribution of this advice letter is being made to the attached service list in accordance with General Order No. 96-B.

Sincerely,



Ronald Moore
Senior Regulatory Analyst, Regulatory Affairs

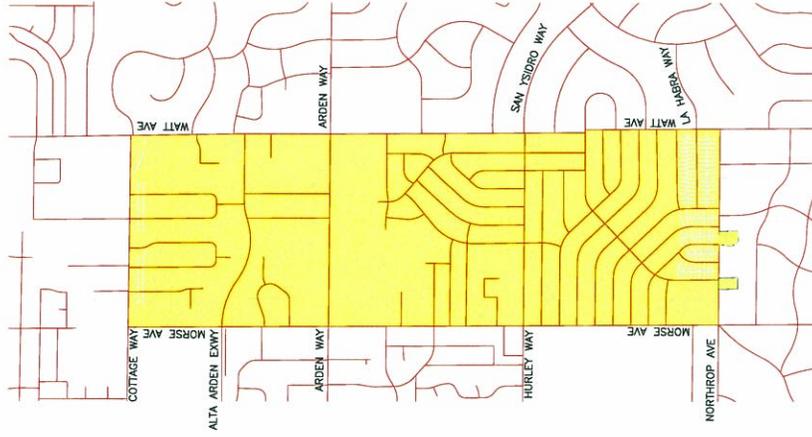
c: Danilo Sanchez, CPUC- Water Branch, DRA
Hani Moussa, CPUC- Water Branch, DRA

GOLDEN STATE WATER COMPANY
630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

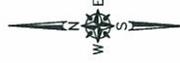
REVISED _____ Cal. P.U.C. Sheet No. 5248-W
Cancelling REVISED _____ Cal. P.U.C. Sheet No. 4156-W

NORTHERN DISTRICT ARDEN-CORDOVA SERVICE AREA

 Indicates Existing Service Area



Arden System



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Utility)

Advice Letter No. 1276-W

Decision No. 08-01-043

ISSUED BY

F.E. WICKS

PRESIDENT

(To be inserted by Cal. P.U.C.)

Date Filed _____

Effective _____

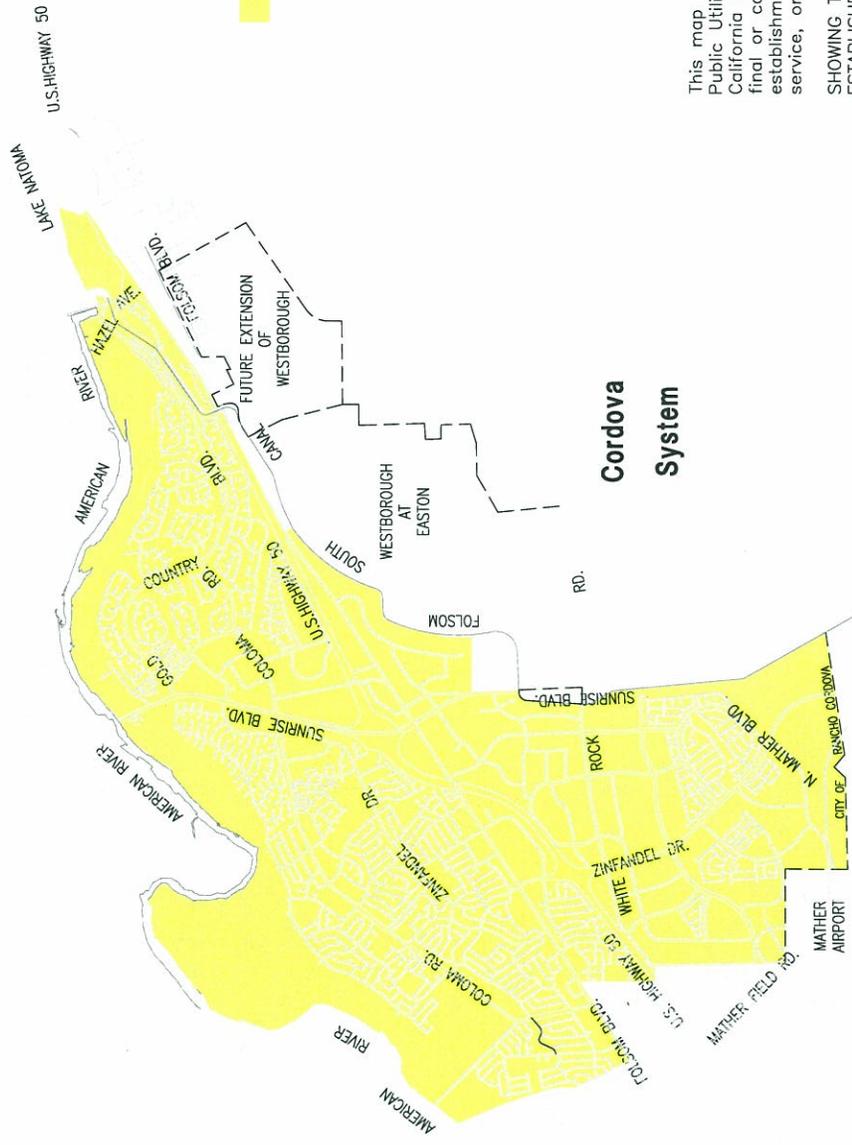
Resolution No. _____

GOLDEN STATE WATER COMPANY
630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

REVISSED _____ Cal. P.U.C. Sheet No. 5249-W
REVISSED _____ Cal. P.U.C. Sheet No. 4156-W
Cancelling _____

NORTHERN DISTRICT ARDEN-CORDOVA SERVICE AREA

Indicates Existing Service Area



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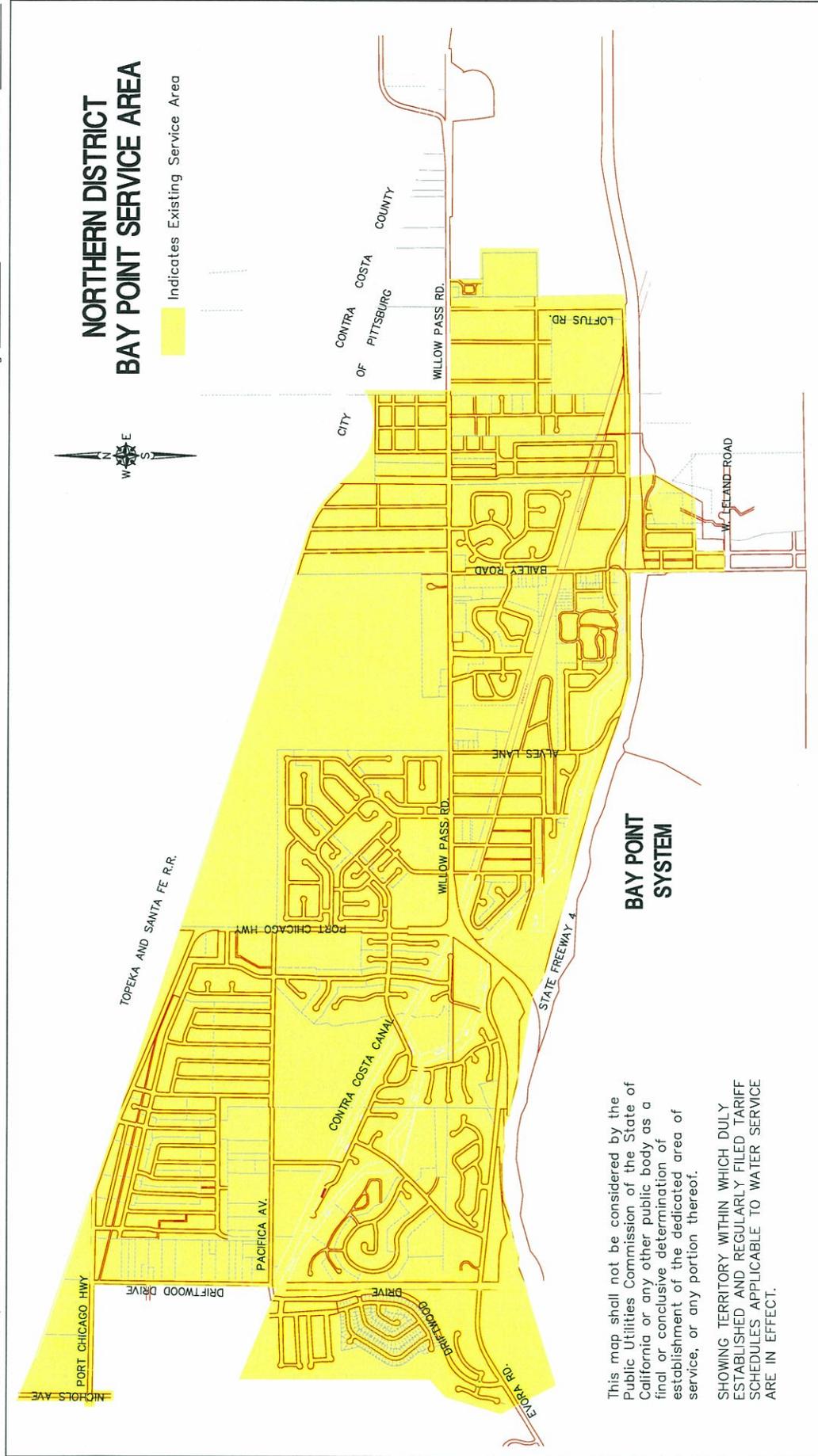
(To be inserted by Utility)
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Decision No. 08-01-043

ISSUED BY
F.E. WICKS
PRESIDENT

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GOLDEN STATE WATER COMPANY
630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

REVISED Cal. P.U.C. Sheet No. 5250-W
Cancelling REVISED Cal. P.U.C. Sheet No. 2963-W



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

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(To be inserted by Utility)

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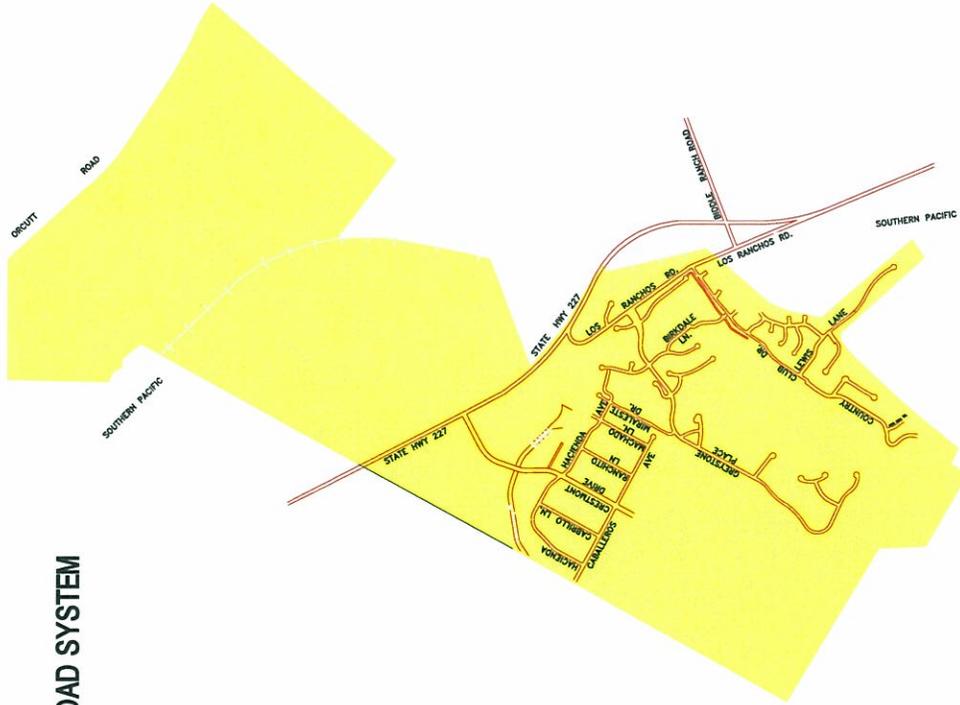
GOLDEN STATE WATER COMPANY
630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

REVISSED _____ Cal. P.U.C. Sheet No. 5252-W
REVISSED _____ Cal. P.U.C. Sheet No. 3564-W
Cancelling _____

EDNA ROAD SYSTEM

COASTAL DISTRICT LOS OSOS SERVICE AREA

 Indicates Existing Service Area



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Utility)

Advice Letter No. 1276-W _____

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ISSUED BY

F.E. WICKS

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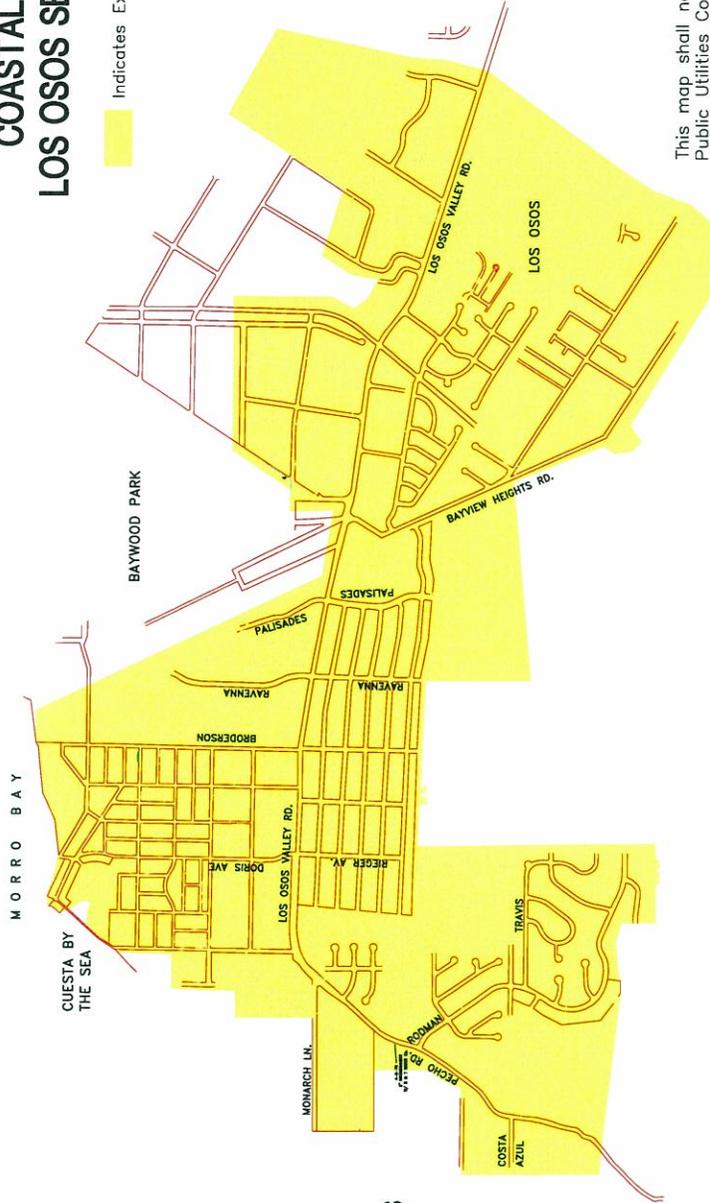
Resolution No. _____

GOLDEN STATE WATER COMPANY
 630 E. FOOTHILL BLVD.
 SAN DIMAS, CA 91773

REVISED _____ Cal. P.U.C. Sheet No. 5253-W
 Cancelling REVISED _____ Cal. P.U.C. Sheet No. 4979-W

COASTAL DISTRICT LOS OSOS SERVICE AREA

 Indicates Existing Service Area



LOS OSOS
 SYSTEM

This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Utility)
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 Decision No. 08-01-043

ISSUED BY
F.E. WICKS
 PRESIDENT

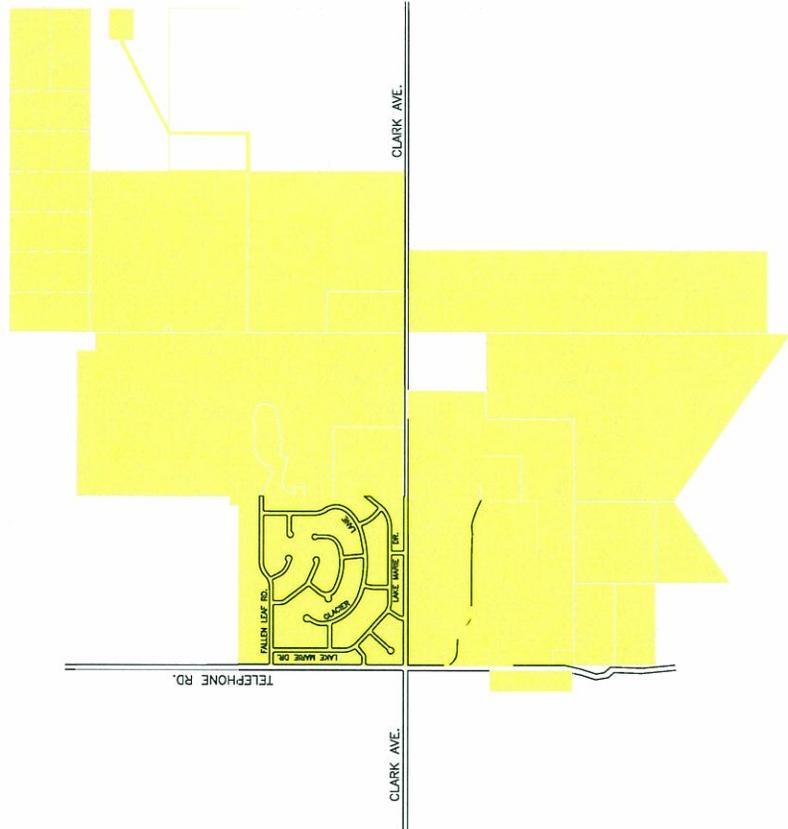
(To be inserted by Cal. P.U.C.)
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GOLDEN STATE WATER COMPANY
630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

REVISÉD Cal. P.U.C. Sheet No. 5255-W
Cancelling REVISED Cal. P.U.C. Sheet No. 4731-W

COASTAL DISTRICT SANTA MARIA SERVICE AREA

Indicates Existing Service Area



Lake Marie
System

This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Utility)
Advice Letter No. 1276-W
Decision No. 08-01-043

ISSUED BY
F.E. WICKS
PRESIDENT

(To be inserted by Cal. P.U.C.)
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GOLDEN STATE WATER COMPANY
630 E. Foothill Blvd.
San Dimas, CA 91773

REVISED Cal. P.U.C. Sheet No. 5256-W
Cancelling REVISED Cal. P.U.C. Sheet No. 4731-W

COASTAL DISTRICT SANTA MARIA SERVICE AREA

Indicates Existing Service Area

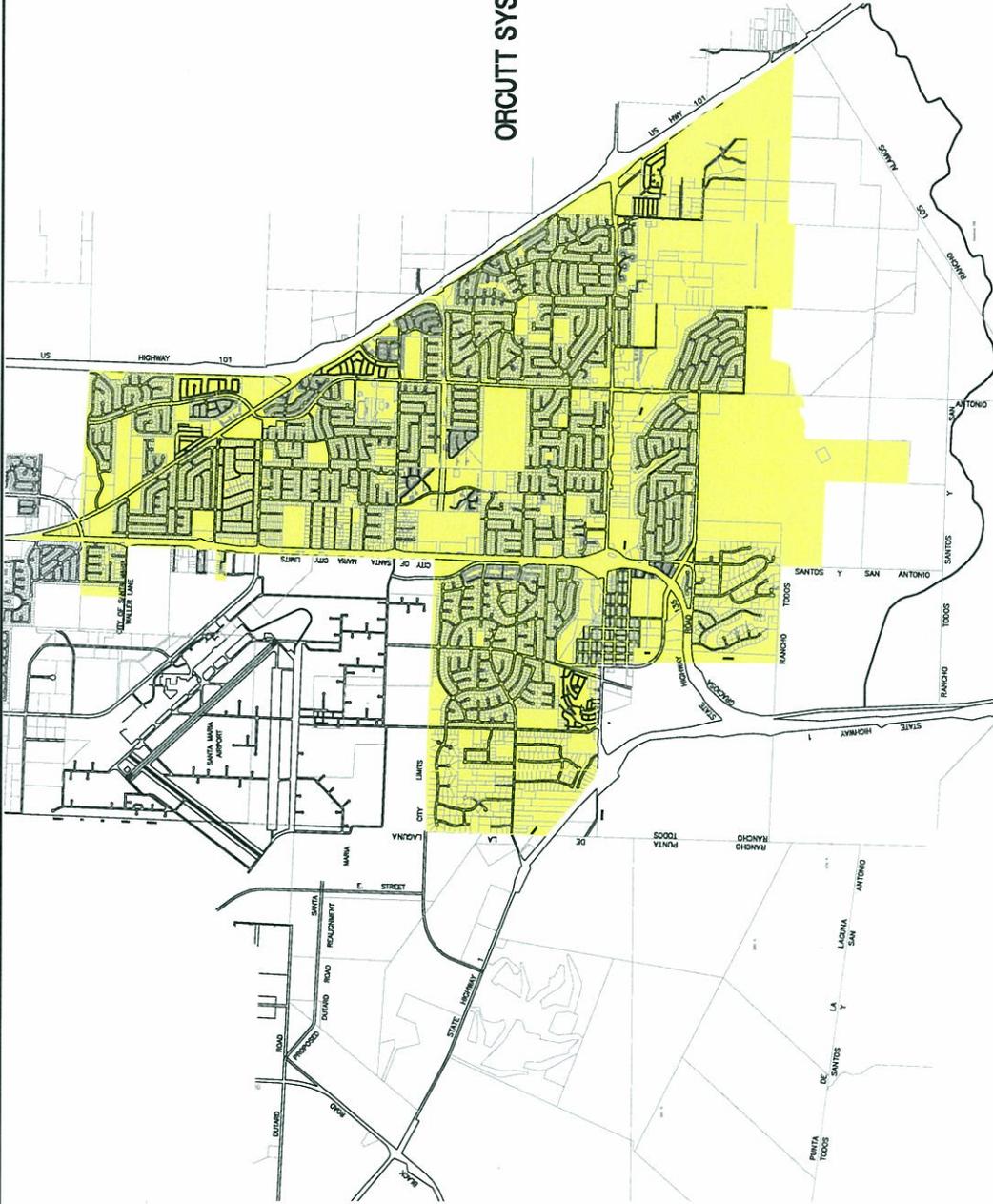


ORCUTT SYSTEM



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

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(To be inserted by Utility)

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ISSUED BY

F.E. WICKS

PRESIDENT

(To be inserted by Cal. P.U.C.)

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Effective

Resolution No.

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630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

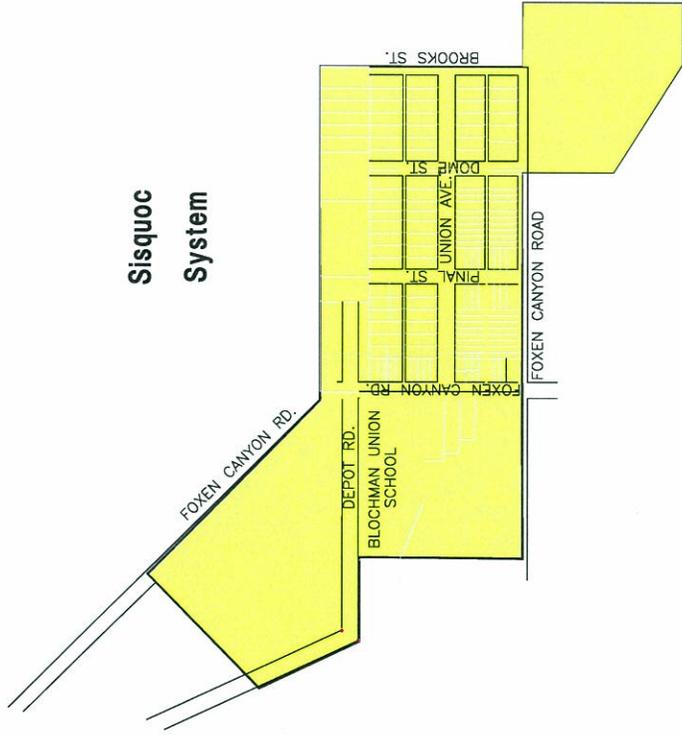
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Cancelling REVISED _____ Cal. P.U.C. Sheet No. 4731-W

COASTAL DISTRICT SANTA MARIA SERVICE AREA

Indicates Existing Service Area



Sisquoc System



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

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(To be inserted by Utility)
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ISSUED BY
F.E. WICKS
PRESIDENT

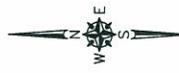
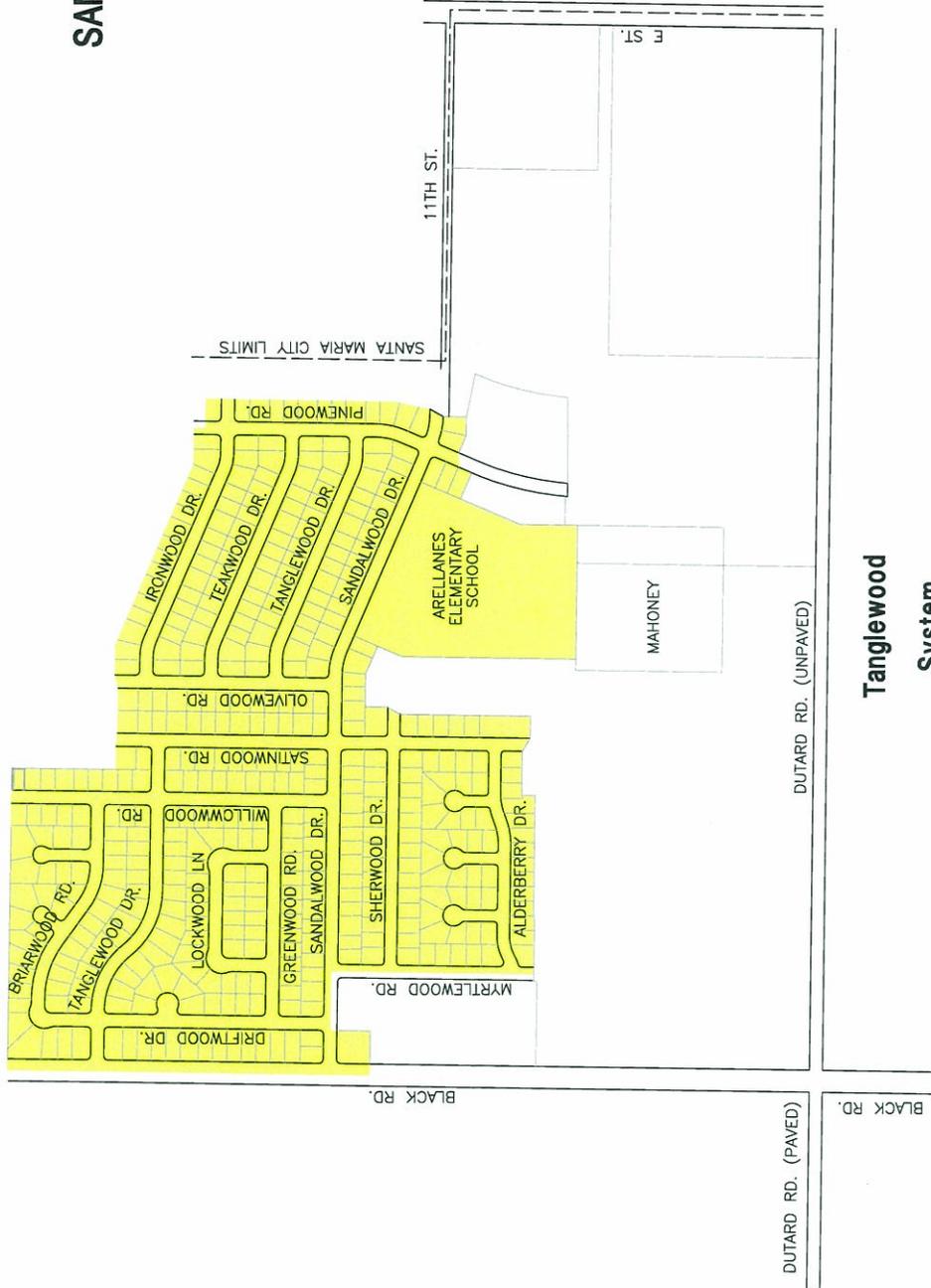
(To be inserted by Cal. P.U.C.)
Date Filed _____
Effective _____
Resolution No. _____

GOLDEN STATE WATER COMPANY
 630 E. FOOTHILL BLVD.
 SAN DIMAS, CA 91773

REVISED Cal. P.U.C. Sheet No. 5258-W
 REVISED Cal. P.U.C. Sheet No. 4731-W
 Cancelling

COASTAL DISTRICT SANTA MARIA SERVICE AREA

Indicates Existing Service Area



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SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Utility)
 Advice Letter No. 1276-W
 Decision No. 08-01-043

ISSUED BY
F.E. WICKS
 PRESIDENT

(To be inserted by Cal. P.U.C.)
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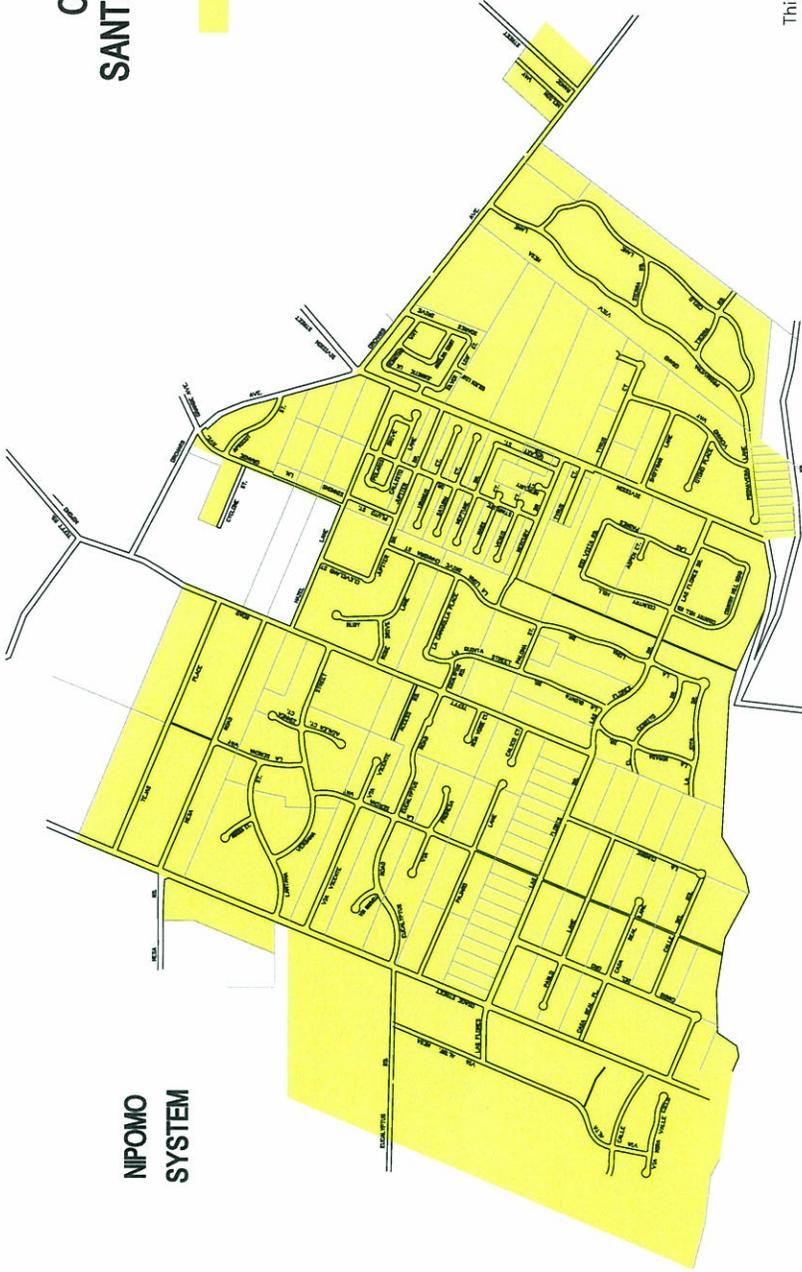
GOLDEN STATE WATER COMPANY
630 E. FOOTHILL BLVD.
SAN DIMAS, CA 91773

REVISÉD Cal. P.U.C. Sheet No. 5259-W
Cancelling REVISÉD Cal. P.U.C. Sheet No. 3957-W

COASTAL DISTRICT SANTA MARIA SERVICE AREA

NIPOMO SYSTEM

Indicates Existing Service Area



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Utility)

Advice Letter No. 1276-W

Decision No. 08-01-043

ISSUED BY

F.E. WICKS
PRESIDENT

(To be inserted by Cal. P.U.C.)

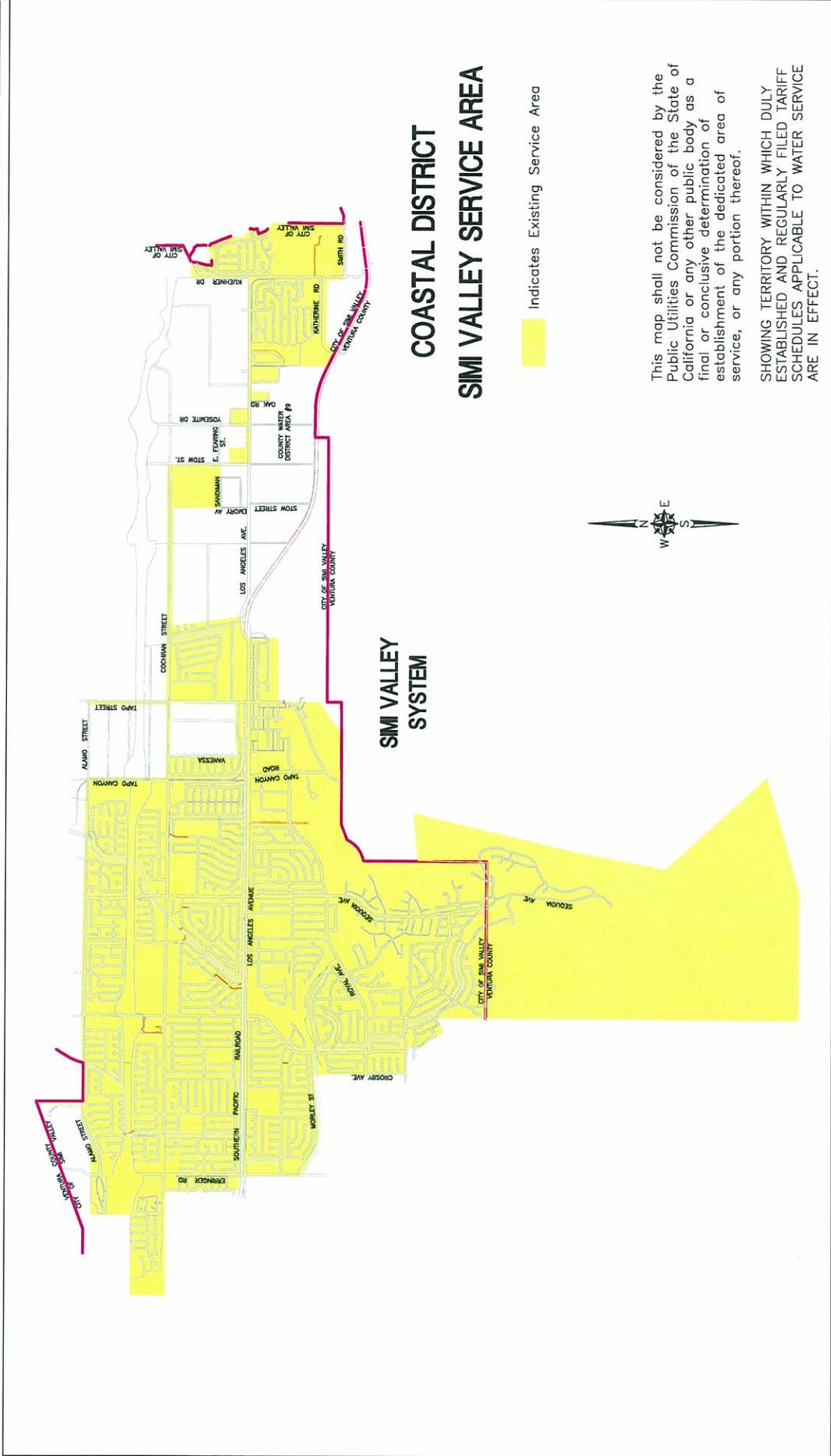
Date Filed

Effective

Resolution No.

GOLDEN STATE WATER COMPANY
 630 E. Foothill Blvd.
 San Dimas, CA 91773

REVISED Cal. P.U.C. Sheet No. 5260-W
 CANCELLING REVISED Cal. P.U.C. Sheet No. 4799-W



This map shall not be considered by the Public Utilities Commission of the State of California or any other public body as a final or conclusive determination of establishment of the dedicated area of service, or any portion thereof.

SHOWING TERRITORY WITHIN WHICH DULY ESTABLISHED AND REGULARLY FILED TARIFF SCHEDULES APPLICABLE TO WATER SERVICE ARE IN EFFECT.

(To be inserted by Cal. P.U.C.)
 Date Filed _____
 Effective _____
 Resolution No. _____

ISSUED BY
F.E. WICKS
 PRESIDENT

(To be inserted by Utility)
 Advice Letter No. 1276-W
 Decision No. 08-01-043

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Morongo Valley	2733-W	
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(Continued)

Advice Letter No. 1276-W

Decision No. 08-01-043

ISSUED BY

F. E. WICKS

President

Date Filed _____

Effective Date _____

Resolution No. _____

GOLDEN STATE WATER COMPANY

SERVICE LIST

REGION 1

Sacramento Suburban Water District
3701 Marconi Avenue, Suite 100
Sacramento, CA 95821
rroscoe@sswd.org

Citrus Heights
Water District
6230 Sylvan Road
Citrus Heights, CA 95610

Carmichael Water District
7837 Fair Oaks Blvd.
Carmichael, CA 95608 – 2405

Citizens Utilities Company of
California
4701 Beloit Drive
Sacramento, CA 95838

Fairoaks Water District
10317 Fairoaks Blvd.
Fairoaks, CA 95628

City of Folsom
50 Natoma Street
Folsom, CA 95630

Orange Vale Water Co.
P. O. Box 620800
9031 Central Avenue
OrangeVale, CA 95662
swilcox@orangevalewater.com

Director
Sacramento County Water Agency
827 7th Street, Room 301
Sacramento, California 95814

City of Antioch
P. O. Box 5007
Antioch, CA 94531
pharrington@ci.antioch.ca.us

Bay Point Municipal Advisory Council
P O Box 5038
Bay Point, CA 94565

City of Brentwood
708 Third Street
Brentwood, CA 94513

Contra Costa Water District
Public Affairs Department
P. O. BOX H2 O
Concord, CA 94520

Contra Costa County Water Agency
651 Pine Street
4th Floor Northwing
Martinez, CA 94553

Diablo Water District
P. O. Box 127
Raley's Shopping Center, 2107 Main St.
Oakley, CA 94561-0127

General Manager
East Bay Municipal Utility District
375 – 11th Street, MS #804
Oakland, CA 94607

City of Martinez
525 Henrietta Avenue
Martinez, CA 94553

Bay Point Project Area Committee
c/o Contra Costa County
Redevelopment Agency
651 Pine St., 4th Flr, N.Wing
Martinez, CA 94553
mtoms@cd.cccounty.us

Konocti County Water District
15844 – 35th Street
Clearlake, CA 95422
kcwd@mchsi.com

Arroyo Grande Municipal Water Dept.
P.O. Box 550
Arroyo Grande, CA 93420
(805) 489-1303
STaylor@arroyogrande.org

Utilities Department
Los Osos Community Services District
P O Box 6064
Los Osos, CA 93412
(805) 528-1455

Los Osos CSD
2122 - 9th Street
Los Osos, CA 93402
Attn: Bruce Buel

San Luis Obispo City Water
955 Morro St.
San Luis Obispo, CA 93403
GHenderson@slocity.org

Casitas Municipal Water District
1055 Ventura Ave.
Oak View, CA 93022

Ventura River County Water District
409 Old Baldwin Road
Ojai, CA 93023
805-646-3403
matt@vrcwd.com

Highlands Mutual Water Company
P.O. BOX 1090
Clearlake, CA 95422

Local Agency Formation Commission
P. O. Box 2694
Granite Bay, CA 95746

Avila Beach County Water
192 San Miguel
Avila Beach, CA 93424

Cambria Community Services District
1316 Tamson Drive, Suite 201
P.O. Box 65
Cambria, CA 93428

Morro Bay City Water (City Hall)
595 Harbor Blvd.
Morro Bay, CA 93442
(805) 772-1214

S & T Mutual Water Co.
P.O. Box 6391
Los Osos, CA 93412

Meiners Oaks Water District
202 W. El Roblar
Ojai, CA 93023
Mikeh20@sbcglobal.net

City Manager
City of Ojai
P. O. Box 1570
Ojai, CA 93024

Nipomo Community Services Dist.
P. O. Box 326 (Mail)
148 S. Wilson (Location)
Nipomo, CA 93444

Charles Baker, President
Rural Water Company
P.O. Box 745
Grover Beach, CA 93483

City of Santa Maria
2065 East Main Street
Santa Maria, CA 93454
rsweet@ci.santa-maria.ca.us

Calleguas Municipal Water District
2100 Olsen Road
Thousand Oaks, CA 91362

Ventura County Water Works
P. O. Box 250
7150 Walnut Canyon Road
Moorpark, CA 93021

City Attorney
City of Ojai
P.O. Box 7209
Ventura, CA 93006

City Clerk
City of Ojai
P. O. Box 1570
Ojai, CA 93024

City Attorney
City of Clearlake
14050 Olympic Drive
Clearlake, CA 95422

City Clerk
City of Clearlake
14050 Olympic Drive
Clearlake, CA 95422

City Clerk & City Attorney
City of Guadalupe
918 Obispo Street
Guadalupe, CA 93434

City Attorney & City Clerk
City of Santa Maria
110 East Cook Street
Santa Maria, CA 93454

City Clerk & City Attorney
City of Simi Valley
2929 Tapo Canyon Road
Simi Valley, CA 93065

County Clerk
County of Sacramento
720 9th Street
Sacramento, CA 95814

County Clerk
County of San Luis Obispo
County Government Center, Rm.385
San Luis Obispo, CA 93408

County Clerk
County of Ventura
501 Poli Street
Ventura, CA 93001

Herb Niederberger, Division Chief
Sacramento County
Department of Water Resources
827 7th Street, Room 301
Sacramento, CA 95814

County Counsel
County of Sa Luis Obispo
Room 386 County Government Center
San Luis Obispo, CA 93408

County Counsel
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009

County Counsel and County Clerk
County of Contra Costa
P.O. Box 69
Martinez, CA 94553

Clerk of the Board of Supervisors
Hall of Administration, 4th Floor
800 South Victoria Avenue
Ventura, CA 93009-1920

LAFCO
County Admin. Office #370
County Government Center
San Luis Obispo, CA 93482

California Dept of General Services
Office of Buildings and Grounds
1304 "O" Street, Suite 300
Sacramento, CA 95814

County Counsel
105 East Anapamu Street, Rm. 201
Santa Barbara, CA 93101

Joy D. Parsons, Senior Associate
HILTON FARNKOPF & HOBSON, LLC
2175 N. California Blvd., Suite 990
Walnut Creek, CA 94596

Santa Barbara LAFCO
105 E. Anapamu Room 406
Santa Barbara, CA 93101

Herschel T. Elkins,
Asst. Attorney General
State of California
300 South Spring Street
Los Angeles, CA 90013

**CALIFORNIA PUBLIC UTILITIES
COMMISSION**
Advice Letter Filing Summary Sheet

(Date Filed / Received Stamp by CPUC)

Company Name: Golden State Water Company

CPUC Utility Number: 133 W

Address: 630 East Foothill Blvd.

City, State, Zip: San Dimas, California 91773

AL #: 1276-W **Requested Effective Date:**

Resolution Required?

Contact Name:		Email Address:	Phone No.:	Fax No.:
Filer	Ronald Moore	<u>rkmoores@gswater.com</u>	(909) 394-3600 ext. 682	(909) 394-7427
Alternate	Keith Switzer	<u>kswitzer@gswater.com</u>	(909) 394-3600 ext. 759	No. Tariff Sheets: 14

(Name, email address & Phone and FAX numbers *are required for "Filer"*)

Annual Revenue Change: \$ 0 or .0 %

Date Filed with the CPUC: May 1, 2008 **Date Served to the Service List:** May 1, 2008

Tariff Schedules: Tariff Maps: Arden Cordova, Bay Point, Clearlake, Los Osos, Ojai, Santa Maria, Simi Valley & Table of Contents P.1

Subject of filing: Region 1 Service Area Maps Update
(Service(s) included)

Authorization for filing: Decision No. 08-01-043
(Resolution #, Decision #, etc.)

Related Advice Letter(s): None
(Similar service, replacement filing)

Tier Designation: This advice letter is submitted with a Tier 1 designation.

Notes/Comments: _____
(Other information & reference to advice letter, etc.)

Send Protest and/or Correspondence within 20 days to:

Director, Water Division
505 Van Ness Ave., San Francisco, CA 94102

and if you have email capability, also email to:

water_division@cpuc.ca.gov

Protest also must be served on Utility:

(see attached advice letter for more information)

(FOR CPUC USE ONLY)

WTS Program/Activity/Type
_____/_____/_____

Resolution Required

WD Suspension on: ___ / ___ / ___

Comm. Suspension on: ___ / ___ / ___

Resolution No.: W - _____

Rev. 04/01/05

Supv. / Analyst _____ / _____

Due Date to Supv.: _____

Analyst Completion Date: _____

Supervisor Approval Date: _____

AL / Tariff Effective Date: _____

Notes: _____

Golden State Water Company

A Subsidiary of American States Water Company
 630 E. Foothill Blvd.
 San Dimas, CA 91773



Si necesita asistencia en Español, tenemos representantes de servicio al cliente disponibles para ayudarle cuando lo solicite, por favor llame al número 1-800-999-4033.

**NOTICE OF APPLICATION FILING FOR A GENERAL RATE INCREASE BY
 GOLDEN STATE WATER COMPANY
 (APPLICATION NO. 14-07-006)
 SANTA MARIA SERVICE AREA**

On July 15, 2014, Golden State Water Company (GSWC) filed their General Rate Case (GRC), Application 14-07-006, with the California Public Utilities Commission (CPUC). The application filing by GSWC requests to increase rates over a three-year period for service in 2016, 2017, and 2018. GSWC is requesting authorization to increase revenues over current revenue in the Santa Maria service area by \$402,200 (or 3.64 percent) for 2016, by \$470,900 (or 4.09 percent) in 2017, and \$474,600 (or 3.94 percent) in 2018.

The CPUC requires GSWC to submit a GRC on a three-year cycle. This rate application covers the period for 2016, 2017, and 2018. The CPUC will render a final decision and the amount approved by the CPUC could vary from the original request by GSWC.

GSWC's Santa Maria Service Area serves approximately 13,100 customers in all or portions of the cities of Santa Maria, San Luis Obispo and vicinity, San Luis Obispo and Santa Barbara Counties.

SUMMARY

The tables below show the average monthly bill by customer class for metered customers, **excluding any applicable surcharges**, if the proposed application is approved by the CPUC:

Year	Residential				Commercial			
	Monthly Bill for a 5/8 x 3/4" meter using 18 CCF				Monthly Bill for a 5/8 x 3/4" meter using 18 CCF			
	Current	Dollar Change	Proposed	% Increase	Current	Dollar Change	Proposed	% Increase
2016	\$50.78	\$2.51	\$53.29	5.0%	\$50.90	\$4.58	\$55.48	9.0%
2017	\$53.29	\$2.21	\$55.50	4.2%	\$55.48	\$2.17	\$57.65	3.9%
2018	\$55.50	\$2.20	\$57.70	4.0%	\$57.65	\$2.28	\$59.93	4.0%

Year	Industrial				Public Authority			
	Monthly Bill for a 5/8 x 3/4" meter using 4 CCF				Monthly Bill for a 2" meter using 531 CCF			
	Current	Dollar Change	Proposed	% Increase	Current	Dollar Change	Proposed	% Increase
2016	\$24.30	\$0.80	\$25.10	3.3%	\$1,142.90	\$140.70	\$1,283.60	12.3%
2017	\$25.10	\$0.91	\$26.01	3.6%	\$1,283.60	\$52.24	\$1,335.84	4.1%
2018	\$26.01	\$1.02	\$27.03	3.9%	\$1,335.84	\$53.08	\$1,388.92	4.0%

GSWC also proposes to modify the existing residential tariff from a 3-tier usage rate to a 4-tier usage rate to promote conservation. The table below shows the current and proposed tier structures:

	Current	Proposed
Tier 1	0 -15 ccf	0 -10 ccf
Tier 2	16 – 27 ccf	11 – 25 ccf
Tier 3	28 & over	26 – 52 ccf
Tier 4	N/A	53 & over

Additionally, GSWC proposes to set the non-residential usage rate for metered service at the second tier rate of the residential tariff (11 -25 ccf), instead of the existing first tier rate (0 – 15 ccf).

GSWC also proposes to establish a special facilities fee, which will be based on meter size, in GSWC's Santa Maria service area that would apply on a prospective basis to new developments. This is being requested as a pilot program to be reevaluated in GSWC's next GRC, which is expected to be filed in July 2017.

Service Size	Fee
1-inch (or less)	\$1,300
2-inch	\$4,160
4-inch	\$13,000
6-inch	\$26,000
8-inch	\$41,600
10-inch	\$59,800

In accordance with CPUC guidelines GSWC proposes new service charge rates for non-residential customers with dual-purpose meters that are larger than otherwise necessary due to fire sprinkler systems that are served from the same meter.

PRIMARY DRIVERS OF RATE INCREASE

The increases in revenue are due in part to increases in the following: 1) purchased power, 2) outside services expenses, 3) labor expenses, 4) customer billing supplies 5) pension and benefit expenses. GSWC is also forecasting several decreases in some business operating areas including federal income tax, other operating expenses, and allocated general office costs.

FOR FURTHER INFORMATION AND TO OBTAIN A COPY OF THE APPLICATION

A copy of GSWC's Application No. 14-07-006, and related exhibits, may be reviewed at GSWC's Santa Maria Customer Service Area Office located at 2330 A St., Unit A, Santa Maria, California 93455, between the hours of 8:00 a.m. to 5:00 p.m. The application may also be reviewed at the CPUC's Central Files Office between the hours of 8:00 a.m. to noon daily in San Francisco, at 505 Van Ness Avenue, San Francisco, California 94102.

If you need additional information, you may visit www.gswater.com or call GSWC's 24-hour Customer Service Center; toll free, at 1-800-999-4033, TTY 1-877-933-9533.

CPUC PROCESS

As a party of record, the Office of Ratepayer Advocates (ORA) will review this application. ORA is the independent consumer advocate within the CPUC with a legislative mandate to represent investor-owned utility customers to obtain the lowest possible rate for service consistent with reliable and safe service levels. ORA has a multi-disciplinary staff with expertise in economics, finance, accounting and engineering. Other parties of record will also participate in the CPUC's proceeding to consider this application. For more information about ORA, please call (415) 703-1584, e-mail ora@cpuc.ca.gov or visit ORA's website at <http://ora.ca.gov/default.aspx>.

This application will be assigned to an Administrative Law Judge (Judge) who will determine how to receive evidence and other related documents, necessary for the CPUC to establish a record upon which to base its decision. Evidentiary Hearings (EHs) may be held where utilities, consumer advocacy groups, and other entities which have been given official status as "parties," will present their testimony and may be subject to cross-examination by other parties. These EHs are open to the public, but only those who are parties may participate. The hearings and documents submitted in the proceeding become part of the formal record. The Judge relies upon the formal record when writing a proposed decision to present to the Commissioners for their consideration.

After considering all proposals and all evidence presented during the formal hearing process, the assigned Judge will issue a proposed decision, determining whether to adopt GSWC's request, modify it, or deny it. Any CPUC Commissioner may sponsor an alternate decision. The proposed decision, and any alternate decisions, will be discussed and voted upon at a scheduled Commission Voting Meeting.

STAY INFORMED

If you would like to follow this proceeding, or any other issue before the CPUC, you may use the CPUC's free subscription service. Sign up at: <http://subscribecpuc.cpuc.ca.gov/>.

If you would like to learn how you can participate in the proceeding, or if you have informal comments or questions about the CPUC processes, you may access the CPUC's Public Advisor's Office (PAO) webpage at www.cpuc.ca.gov/puc and click on "Public Advisor" from the CPUC Information Menu. You may also contact the PAO as follows:

Write: CPUC Public Advisor's Office, Room 2103
505 Van Ness Avenue
San Francisco, CA 94102

Email: public.advisor@cpuc.ca.gov

Phone: 1-866-849-8390 (toll-free) or 1-415-703-2074
1-866-836-7825 (toll-free) or TTY 1-415-703-5282

Please reference **GSWC's GRC Application No. 14-07-006** in any communications you have with the Commission regarding this matter. All public comments will become part of the public correspondence file for this proceeding and made available for review for the assigned Judge, the Commissioners, and appropriate CPUC staff.

GOLDEN STATE WATER COMPANY

2016-2018 Rate Information

A Message from your General Manager



On behalf of Golden State Water Company (Golden State Water), I'd like to thank you for being a valued customer.

As you may have heard, Golden State Water's 2016-2018 General Rate Case was recently approved by the California Public Utilities Commission (CPUC) to establish water rates for the period from 2016-2018.

This approval was originally expected prior to Jan. 1, 2016; however, the approval was delayed more than 14 months by factors outside of Golden State Water's control. Those factors include (but are not limited to) the drought emergency and additional time the CPUC required to adjust usage forecasts reflective of reduced water usage throughout the state.

Golden State Water is a regulated utility and our rates are determined every three years through a General Rate Case (GRC) with the CPUC, which ensures customers receive a fair rate for reliable, quality water service.

The GRC establishes water rates to reflect the full cost of providing water service, maintaining the infrastructure and making needed system improvements.

We appreciate your patience and understanding. If you have any questions, please visit our website at gswater.com/Santa-Maria for more information or call us anytime at 800.999.4033.

Golden State Water has provided reliable, quality water service and been a trusted local community partner for more than 40 years, and we look forward to serving for generations to come.

Sincerely,

Mark Zimmer
General Manager, Coastal District
Golden State Water Company

What is the 2016-2018 General Rate Case?

As a regulated utility, Golden State Water Company (Golden State Water) rates are determined by the California Public Utilities Commission (CPUC) to reflect the full cost to provide water service, maintain the infrastructure and make needed system improvements.

A General Rate Case (GRC) is a process conducted by the CPUC to determine rates for regulated utilities. Every three years, the CPUC conducts an open and transparent review of Golden State Water's rate proposal to ensure customers pay a fair price for reliable, quality water service.

The GRC process is very thorough and generally lasts 18 months with oversight

from the Office of Ratepayer Advocates and opportunity for customers to participate.

In March 2017, the CPUC approved Golden State Water's GRC establishing rates for 2016, 2017 and 2018. This decision was expected before Jan. 1, 2016; however, the approval was delayed more than 14 months by the CPUC.

The lengthy delay prevented Golden State Water from implementing the new rates for 2016 on schedule, and 2015 rates remained in place through the delay period.

The new approved rates for 2017 were implemented on April 20, 2017.

Additionally, Golden State Water is required to balance the difference between the rates customers actually paid during 2016 (2015 rates) and the recently approved 2016 rates. Any over-collected revenue will be refunded to customers, and any under-collected revenue will be recovered through a temporary surcharge.

For additional information on the GRC, please visit gswater.com/Santa-Maria.



Golden State
Water Company

A Subsidiary of American States Water Company

2016-2018 Rate Information



Customers in the Santa Maria service area will benefit from a wide range of investments to address water supply, storage and distribution needs.

Upcoming Projects

• Plant Construction.....	\$1,591,000
• Well Maintenance.....	\$420,000
• Reservoir Maintenance.....	\$897,000
• Residual Analyzers.....	\$394,000
• Pipeline Replacements.....	\$1,890,000
• Meters and Services Installation.....	\$1,069,000
• Disinfection Facility Upgrades.....	\$362,000

Balancing Rates

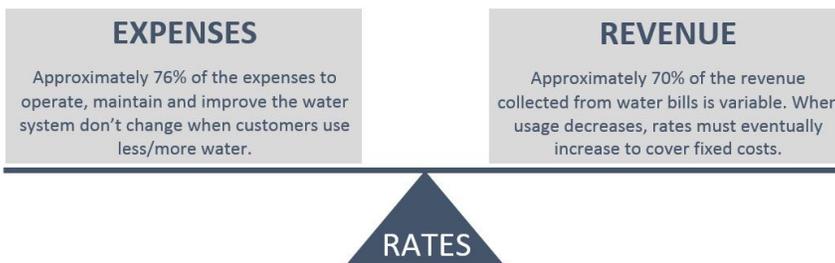
Golden State Water Company (Golden State Water) is regulated by the California Public Utilities Commission (CPUC), and water rates are adjusted every three years through a General Rate Case.

Rates are determined based on a forecast of water usage to ensure they cover the cost of providing water service, maintaining the infrastructure and making system improvements.

Approximately 76 percent of Golden State Water’s utility expenses are fixed—testing water, fixing main leaks and servicing hydrants—meaning they don’t change when customers use less/more water.

On the opposite side, approximately 70 percent of Golden State Water’s revenue is variable. When usage drops, rates must increase to cover operating costs. The opposite would be true if usage is greater than forecasted.

The CPUC makes sure regulated water providers like Golden State Water balance their finances to the penny – no more, and no less than the approved amount. If actual usage does not match the forecasts, “balancing accounts” are utilized to credit back any over-collected revenue or recover any under-collected revenue through a temporary surcharge.



How will my bills be affected in 2017?

Effective April 20, 2017, an average residential customer in the Santa Maria Customer Service Area with a 5/8 x 3/4” meter, using 11,220 gallons (1,500 cubic feet or 15 Ccf) of water per month, would see a monthly bill increase of \$8.04 from \$51.45 to \$59.49 compared to 2016 (excluding any applicable surcharges).

This total includes the 13.0 percent increase approved through the General Rate Case, as well as the 2017 escalation year adjustment.



Rate assistance for qualified customers

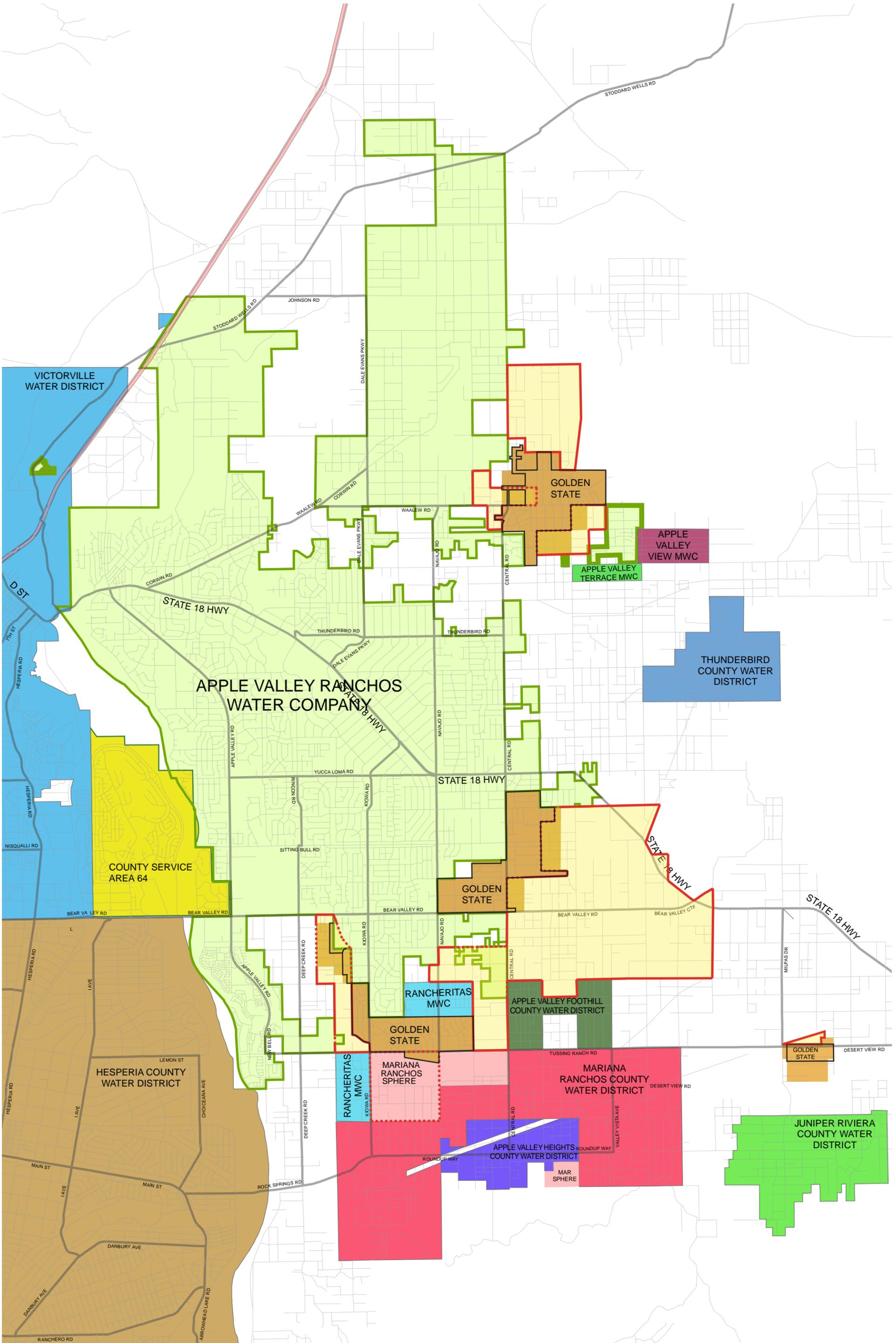
Golden State Water proudly offers a monthly credit for low-income customers who qualify for the California Alternate Rates for Water (CARW) program. Customers with questions about the CARW program or eligibility are encouraged to call Golden State Water’s CARW Hotline at (866) 360-2279.

Visit gswater.com or follow us on Twitter @GoldenStateH2O for more information, and to learn about the programs and rebates available in your area.

What steps has Golden State Water taken to reduce expenses?

- Cost controls to ensure prudent spending
- Appropriate staffing levels and salaries keep labor expenses in line with competitors
- Promoting water-use efficiency saves customers money

General Rate Case
Fact Sheet Available At:
gswater.com/santa-maria



GOLDEN STATE WATER COMPANY SERVICE AREA

1 inch equals 6,500 feet



LOS ALAMOS COMMUNITY SERVICES DISTRICT

82 North Saint Joseph St • (805) 344-4195 • Fax (805) 344-2908

Post Office Box 675

LOS ALAMOS, CALIFORNIA 93440

November 1, 2016

Re: Purchasing RO Water from Oilfields

Dear Mr. Falkenhagen

It was nice talking to you on the phone the other day about your Project and I am in receipt of your letter dated October 31, 2016. I have also discussed this request with our Board of Directors at our Regular Board Meeting on October 26, 2016, and with Jeff Densmore, P.E. State Water Resources Control Board, Division of Drinking Water and we have all concluded that this is not a costly or viable option for Los Alamos Community Services District (LACSD) at this time.

The LACSD provides water and wastewater service to 605 homes to a population of about 1800 people and uses roughly 1% of the overall water within the San Antonio Groundwater Basin, 19% is other domestic uses and 80% goes to agriculture. The LACSD has been working with the Santa Barbara County Water Agency, Vandenberg Air Force Base and the various water stakeholders within the San Antonio Basin for the past several years to conduct a technical study of the overall condition of the basin and to develop a GSA (Groundwater Sustainability Agency) and GSP (Groundwater Sustainable Plan)

In addition, the LACSD currently has a Water Conservation Ordinance in place and is proactively working with the Community to conserve water **due to continued drought conditions not because we feel we are at risk of running out of water.**

With that said, based on our current conservation efforts and based on the condition of LACSD's water wells, in relation to our well soundings, the LACSD's water supply is in fair condition and is in no way at risk of running out of water or at the point that we would need to purchase water from an outside unapproved source.

Although I appreciate your offer to provide RO water from Oilfield Projects, the District has no interest in taking RO water from the oilfield at \$10/unit. The cost including administrative for the LACSD to pump, treat, store and deliver to our customers was just raised on August 1, 2016, to \$2.96 per unit or 100 cubic feet (748 gallons) after a lengthy and costly (\$60,000) Rate Study for which our customers were not happy about.

If we purchased RO water, a new Rate Study under Prop 218 would have to be conducted to reflect the purchased water prices to our customers. The LACSD given our current water

condition and our on-going efforts to establish a GSA with a Groundwater Sustainability Plan believes that the need to purchase outside water is premature and unwarranted at this time. The goal of the San Antonio GSA is to achieve a sustainable Groundwater Basin in the next five to ten years and therefore is no need to purchase water from an outside source.

In addition to the cost factor, the State Water Resources Control Board, Division of Drinking Water has its own requirements and regulations regarding purchased and the blending of two water sources that would be burdensome to the LACSD and would require additional reporting and District resources to ensure that the water being delivered is NSF approved, as well as treated by State Certified Water Treatment Operators. The delivery method via truck directly to our storage tanks raises a multitude of concerns for the LACSD and would more than likely have to be piped in, raising the another concern of who would pay for the installation and maintenance of said piping. There would also be easement issues as well.

Even if we were able to get over all these hurdles, the ultimate question is the cost to the LACSD and its customers and whether or not this is something that is warranted now. The answer is no and until our water conditions change requiring a need for an outside source of water a new Cost Analysis or Rate Study or any other consideration is also not warranted. On behalf of the LACSD and its Board of Directors we respectfully decline your offer and wish you the best for your project. If you have any questions regarding this letter, please let me know.

Sincerely,

A handwritten signature in blue ink that reads "Kevin Barnard". The signature is cursive and fluid.

Kevin Barnard
General Manager
Los Alamos Community Services District
www.losalamoscsl.com

CHAPTER 5

EXISTING PUBLIC WATER SYSTEM

Existing Facilities

The water system consists of production, distribution, and storage facilities. This system includes three wells, three reservoirs, distribution pipelines, disinfection using sodium hypochlorite, liquid sodium hydroxide for corrosion control and a SCADA (Supervisory Control and Data Acquisition) system.

Production Facilities

LACSD owns three operating wells within the District boundaries. Wells #3A, #4 and #5 are the District's production wells. For information on the San Antonio Groundwater Basin and water quality, see Chapter 4 on page 22.

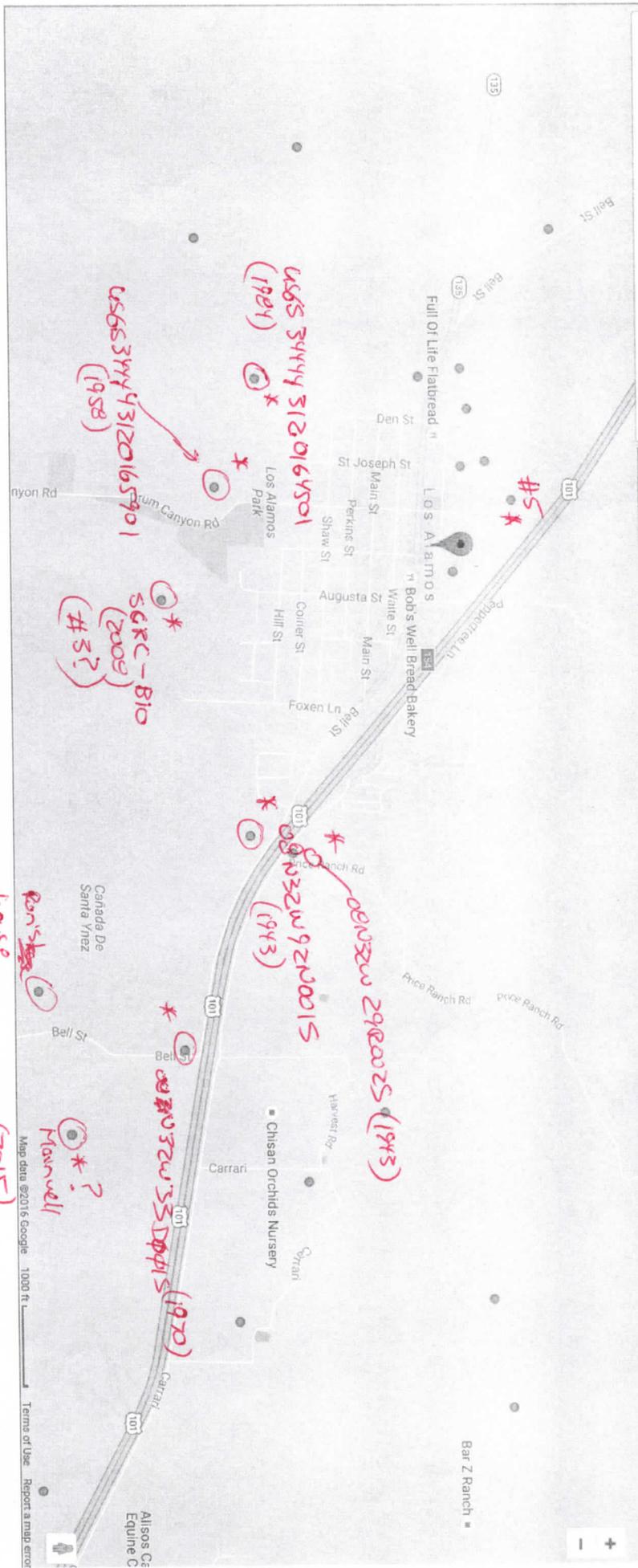
Well #3 was drilled in August 1978. Over the course of the last few years, Well #3 lacked the desired production levels for the District due to a worn casing. The District completed the installation of Well #3A in December 2010, which is approximately 25 feet from Well #3. The close proximity to Well #3 was designed such that Well #3A could tie directly into the distribution lines through the existing building, saving on additional infrastructure. The installation of well #3A also included the addition of SCADA and a variable frequency drive (VFD). Well #3A is 500' deep, 12" diameter PVC casing and currently produces 430 gpm.

Well #4 was drilled in July 1988. In July 2008, Well #4 was slip-lined and had a variable frequency drive motor (VFD) and SCADA installed. Well #4 currently produces 220 gpm. The District anticipates replacing Well #4 in the near future as it reaches its expected design life (25 years). Unfortunately this site does not offer the same ability to install a new well and use the existing infrastructure to tie into the distribution system as Well #3. A new well site will be required.

Well #5 was completed in July 2007. Well #5 is located across Gonzalez Drive from Creekside Village. The installation of well #5 also included the addition of SCADA and a variable frequency drive (VFD). The well is approximately 1000' deep, 12" diameter stainless steel casing and currently produces 750 gpm.

Storage Reservoirs

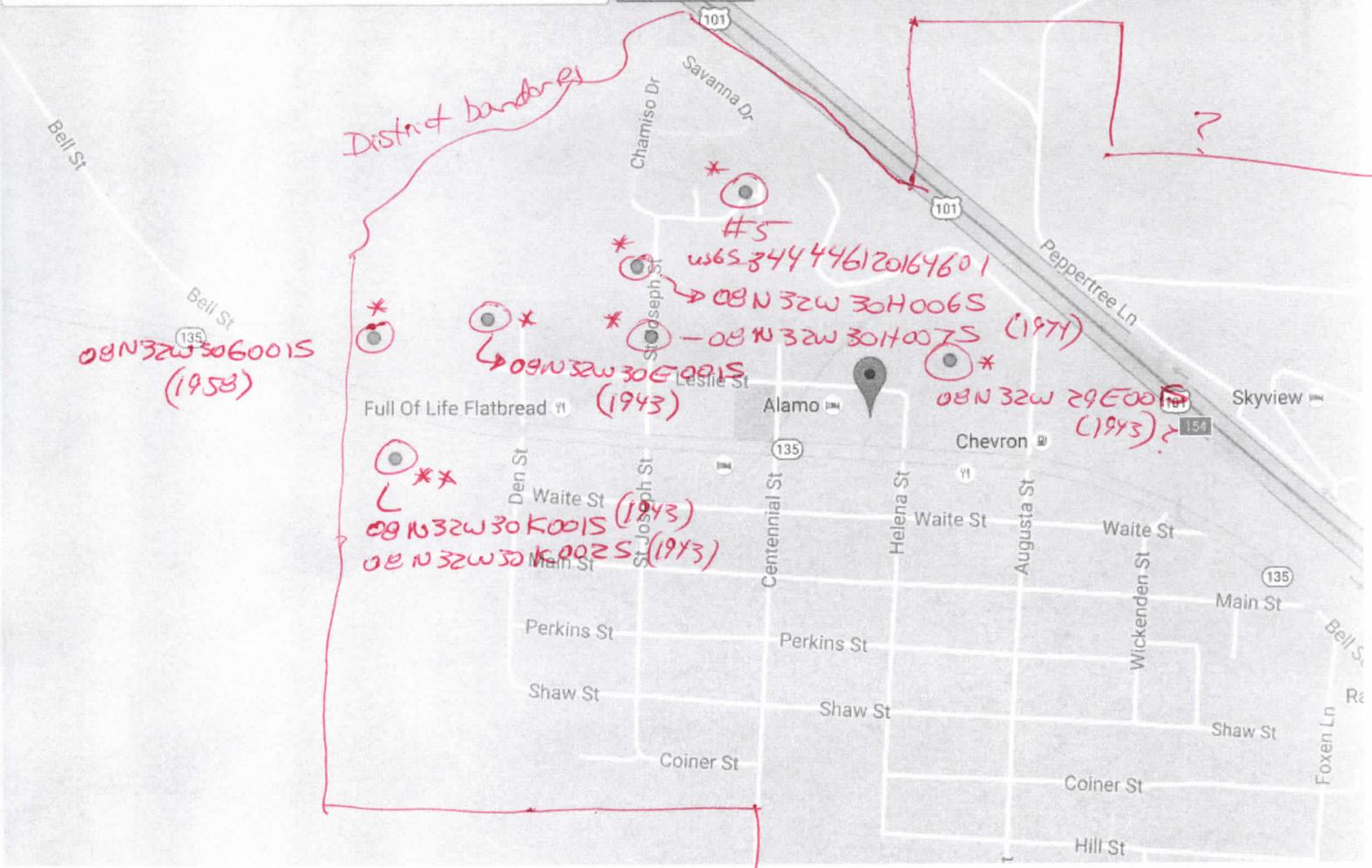
Three reservoirs located in the hills west of the District provide storage and pressure for the water distribution system. There is a 200,000-gallon welded steel tank that was constructed in 1958 and refurbished in 1994 by having the interior recoated. It was placed into service as an emergency backup to provide adequate fire flows. Due to the lower high water elevation of the 200,000-gallon tank compared to the other two reservoirs, this tank can only be used by manually operating the valve. This emergency storage tank is operated once a week to maintain the quality of the water.



* water supps cell

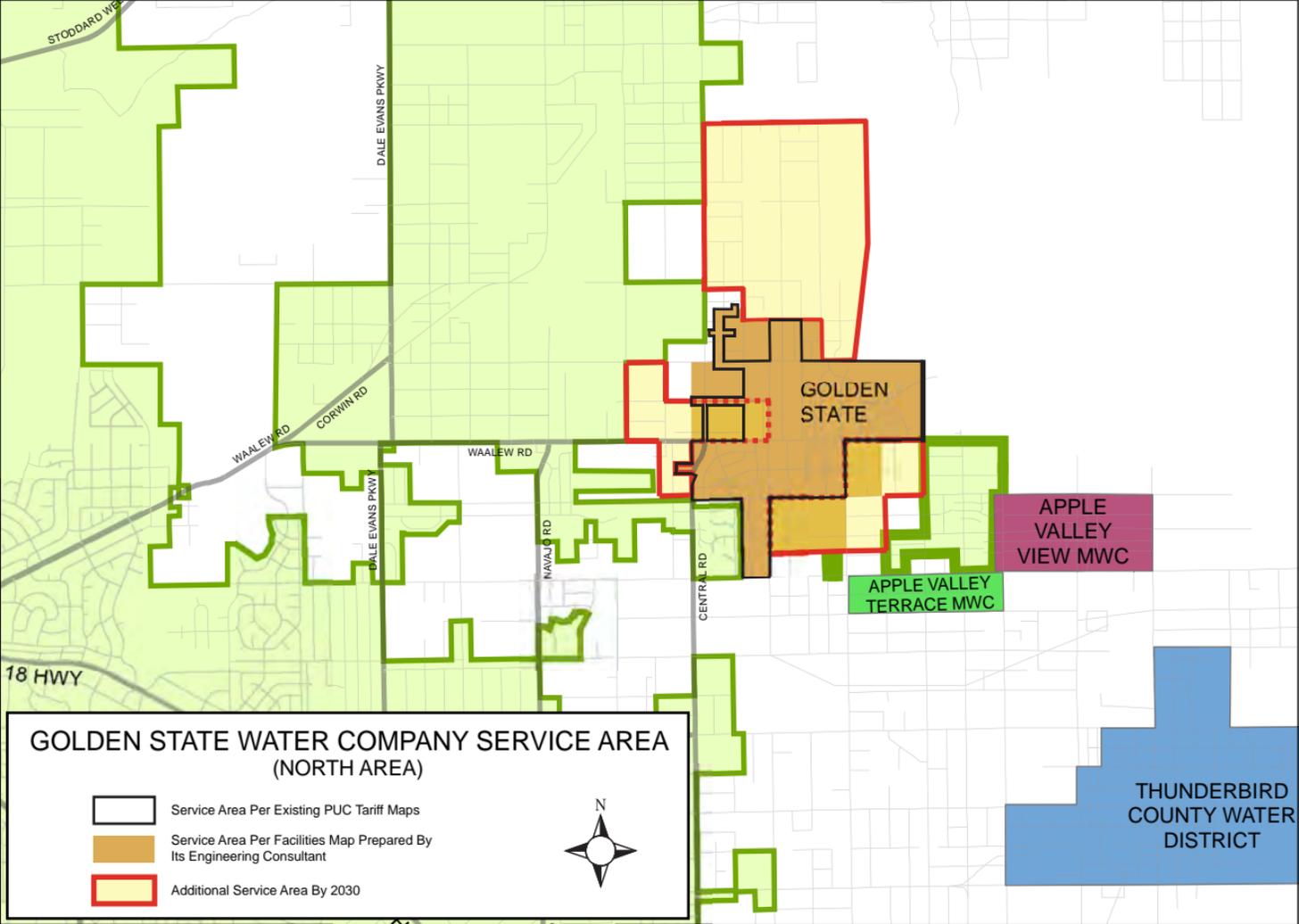
house

(2015)



- #3
- #3A ✓
- #5 ✓
- #6 proposed
- #4 ✓

* water supply well



GOLDEN STATE WATER COMPANY SERVICE AREA (NORTH AREA)

-  Service Area Per Existing PUC Tariff Maps
-  Service Area Per Facilities Map Prepared By Its Engineering Consultant
-  Additional Service Area By 2030

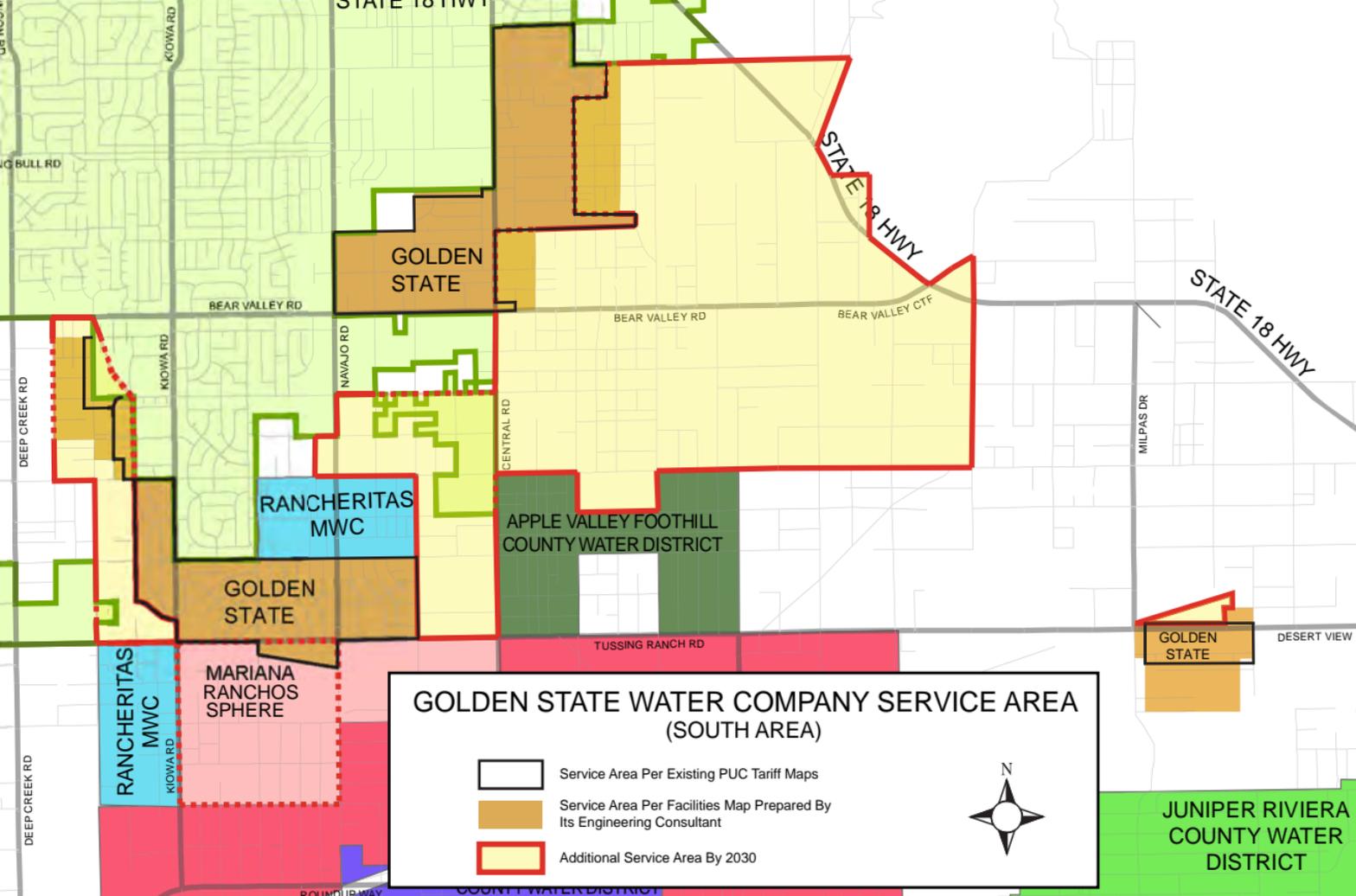


APPLE VALLEY VIEW MWC

APPLE VALLEY TERRACE MWC

GOLDEN STATE

THUNDERBIRD COUNTY WATER DISTRICT



GOLDEN STATE WATER COMPANY SERVICE AREA (SOUTH AREA)

- Service Area Per Existing PUC Tariff Maps
- Service Area Per Facilities Map Prepared By Its Engineering Consultant
- Additional Service Area By 2030



**JUNIPER RIVIERA
COUNTY WATER
DISTRICT**

From: Kevin Barnard [kbarnard@dock.net]
Sent: Thursday, April 20, 2017 9:57 AM
To: 'Bruce Falkenhagen'; Jesse Frederick
Subject: RE: Well Location Verification
Attachments: Well #3A as-built.PDF; LACSD Water Well #4.pdf; LACSD Water Well #5.pdf

Jesse,

It was nice talking to you yesterday. Below is the info you requested, please let me know if you have any questions.

Well #3A

1. Formally known as Well #3 (Well Source Code # 4210002-003) was replaced in 2010 with **Well #3A, Well Source Code # 4210002-009**. Well # 3A is 20 feet from the old Well # 3.
2. Production: 400 gpm.
3. Well Depth: 500 feet.
4. Location: 800 Block Bell Street.
5. Perforations: 180' to 300' 320' to 400' 420' to 500' (please see attached)

Well #4

1. **Well # 4, Well Source Code# 4210002-004** was drilled in 1988.
2. Production: 300 gpm.
3. Well Depth: 535 feet.
4. Location: Price Ranch Rd. and El Camino Real
5. Perforations: 230' to 530' (Please see attached)

Well # 5

1. **Well #5, Source Code # 4210002-007** was drilled in 2007.
2. Production: 700 gpm.
3. Well Depth: 962'
4. Location: 275 Gonzales Drive
5. Perforations: 217' to 352' 502' to 702' 792' to 952' (Please see attached)

We normally don't give well locations but I think this will help give you a better understanding of where our three water wells are located in town. The only other wells we have are monitoring wells at our Wastewater Treatment Plant but are not assigned a Source Code # from the DPH or State Water Board like we have for our potable wells. These monitoring wells fall under our Waste Discharge Requirements, Order No. R3-2005-0133, WDID No. 3 42 011 8001 with the RWQCB.

I hope this helps.

Sincerely,
Kevin Barnard
General Manager
Los Alamos CSD

P.O. Box 675
Los Alamos, Ca. 93440
(805) 344-4195 phone
(805) 344-2908 fax
kbarnard@dock.net
www.losalamoscscsd.com

From: Bruce Falkenhagen [<mailto:brucefal@yahoo.com>]
Sent: Wednesday, April 19, 2017 1:39 PM
To: Jesse Frederick; kbarnard@dock.net
Subject: Re: Well Location Verification

Kevin-

Jesse is asking this as a follow-up to our conversations about the oilfield water "non-project". Please feel free to call or answer him as you wish. If you need any help on this, please feel free to call me also.

Hope everything is well down there!

Bruce Falkenhagen
(805) 541-1895

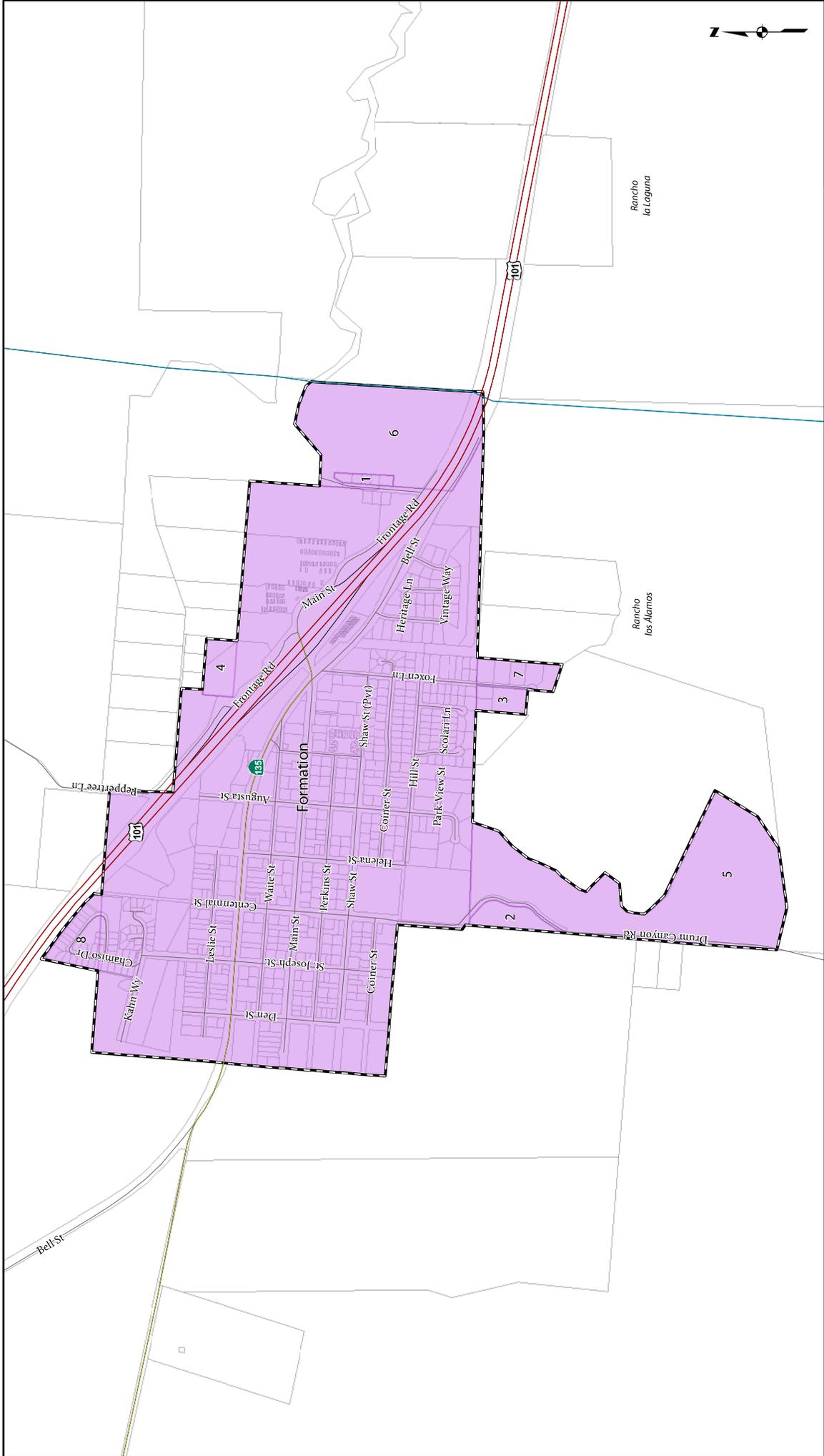
On 4/19/2017 1:22 PM, Jesse Frederick wrote:

Hello-

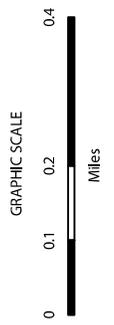
My company (WZI Inc.) is presently assisting Bruce Falkenhagen in applying for an Aquifer Exemption for Cat Canyon Oil Field operators. One of the requirements from State Water Board is that we confer with the nearest community serving water purveyor and verify all well locations for potential adverse impact analysis. Bruce had passed on the results of his previous conversations. Working through Geo Tracker (which now allows password protected access to the locations known by the State Water Board) I have identified four well locations, three of them seem to be inside the CSD boundary and the fourth seems to be located 1.4 miles to the northeast in a field. Can you verify that these are correct? If possible we also need to know the capacity, screening interval and Total Depth. Please feel free to call me.

DATASET	WELL ID	WELL NAME	LATITUDE	LONGITUDE
DHS	W0604210002	4210002-002	34.7667	-120.2823
DHS	W0604210002	4210002-003	34.7408	-120.2704
DHS	W0604210002	4210002-004	34.3938	-120.2654
DHS	W0604210003	4210002-005	34.7471	-120.2823

Best Wishes,
Jesse Frederick, VP WZI Inc.
661 (326) 1112



- Legend**
- Ranchos and Townships
 - Freeways
 - Highways
 - Roads
 - Formation
 - Annexation
 - Detachment
 - Parcels
 - Sections



Los Alamos Community Services District

Compiled by the Office of the County Surveyor in October of 2010. Formed by Board of Supervisors Resolution 16160, 10/29/1956. Last Action: LAFCO 02-05, Hanly Annex, 6/20/2002.

See boundary activity table at <http://www.countyofsb.org/pwd/pwsurveyor.aspx?id=23260>

NOTICE OF DISCLAIMER: This data is for reference only. Although every effort has been made to ensure the accuracy of information, errors and omissions originating from physical sources used to develop the database may be reflected in this data. Santa Barbara County shall not be held responsible for any errors or omissions. This data is provided as a service and is not intended to be used for any purpose other than for the boundary lines shown hereon and lines should not be used to obtain coordinate values, bearings or distances.



Los Alamos Community Services District Boundary Activity

See map at <http://www.countyofsb.org/pwd/pwsurveyor.aspx?id=23260>

InternalNo	Title	Type	Effective	County_Res	County_DT	LAFCO_Res	LAFCO_Date	Instrument	Recorded
0	Los Alamos CSD Formation	Formation	10/29/1956	16160	10/29/1956				
1	Serpa & Gonzales	Annexation	6/15/1965					2108/1365-9	6/15/1965
2	Water Storage Tank	Annexation	6/15/1965					2108/1365-9	6/15/1965
3	Zoellner	Annexation	4/17/1972			200		2395/794-804	4/17/1972
4	Skyview	Annexation	4/17/1972			227		2395/805-816	4/17/1972
5	Los Alamos Park	Annexation	3/22/1979			78-513		1979-0012653	3/22/1979
6	Carrari	Annexation	4/26/1989			88-775		1989-0027332	4/26/1989
7	Foxen Acres	Annexation	6/30/1994			92-04		1994-0054427	6/30/1994
8	Hanly	Annexation	6/20/2002			02-05		2002-0060051	6/20/2002
	Los Alamos CSD Sphere of Influence	SOI	8/3/2006						8/3/2006